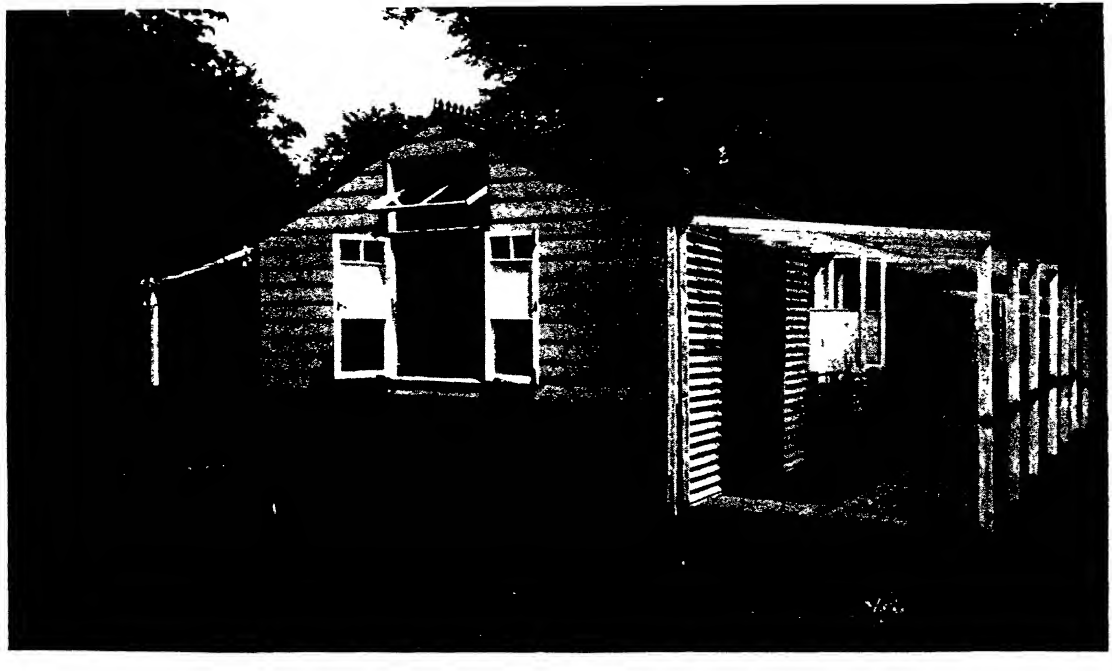
PULMONARY TUBERCULOSIS AND SANATORIUM TREATMENT

A BRIEF SURVEY OF THE SCIENTIFIC, THE SANATORIUM AND THE SOCIAL ASPECT OF TUBERCULOSIS



A GROUP OF CHÂLETS AT THE MENDIP HILLS SANATORIUM.

Frontispiece.

PULMONARY TUBERCULOSIS

AND

SANATORIUM TREATMENT

A RECORD OF TEN YEARS' OBSERVATION AND WORK IN OPEN-AIR SANATORIA

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PREFACE

It is with feelings of deep satisfaction that one looks back to the work of the past ten years, and finds in it the beginning of a great movement that has not only revolutionized the treatment of consumption, but has shown a way for the attainment of larger health and more wholesome living. Open-air sanatoria are really doing the work of the State in that, as so many centres of education, they teach the people the gospel of fresh air to improve their stamina and efficiency, so that they may take their place as worthy citizens of a world-wide empire. I am surprised that little or no mention has been made by the writers on tuberculosis of the pioneers of the open-air movement in this country, most of them medical men, who, in the teeth of ridicule and contempt, adopted what was at first an unpopular treatment, and who have accomplished in ten short years the mighty task of changing public opinion in their favour, of being the instruments of saving many hundreds of lives, and of laying a foundation for a sound reform in the nation's social, economic, and political life. To these professional brethren I would offer my humble tribute.

The first part of this book attempts to deal with the scientific aspect, the second the sanatorium, the third the social aspect of tuberculosis; while the introduction would emphasize the importance of trusting Nature, and of following her methods and ways in the cure and prevention of disease.

Western medical training and temperament, in common with Western thought, tends to view life from a physical

standpoint, and base the treatment of disease accordingly. Man is not a machine, but a living personality. He is also a social being subject to the influence of environment. Both these aspects of life should be borne in mind if we are to solve satisfactorily the problems of tuberculosis, and, in fact, of any disease.

Throughout the volume I have endeavoured to confine myself to record results mainly from my own observation, although much more could be written on the clinical experience of other workers. The open-air treatment has already opened up many avenues for study and observation, and still the subject is not exhausted; there are many fields yet unexplored. I may have wandered in some of these untrodden regions, and have raised questions that may not be in accordance with the views generally accepted by the profession at present. But the reader will overlook any fault if he finds a stimulating thought in these pages, or gathers a few grains of wheat among the chaff.

My sincere thanks are due to Dr. A. Percy Allan and Dr. J. Curtis Webb for their kindness in going over the proofs and for valuable suggestions.

C. MUTHU.

MENDIP HILLS SANATORIUM,
WELLS, SOMERSET,
November, 1909.

CONTENTS

PART I

PART II

PART III

LIST OF ILLUSTRATIONS

PLATES

IN TEXT

PART I

'What are helps of time and place,
When Wisdom stands in need of Nature's grace?'

WORDSWORTH.

PULMONARY TUBERCULOSIS

AND

SANATORIUM TREATMENT

CHAPTER I

INTRODUCTION

'The wisest, happiest of our kind are they
That ever walk content with Nature's way.'

WORDSWORTH.

'So build we up the Being that we are,
Thus deeply drinking in the Soul of things,
We shall be wise perforce.'

Ibid.

THE open-air movement has made steady progress in this country ever since it was introduced about ten or eleven years ago. It has not only revolutionized the treatment of consumption, but, by its brilliant results in saving many lives, it has given a great impetus to the study of tuberculosis in its various aspects.

Vast problems have been opened up in connection with tuberculosis which touch all sides of national and international life. The closer one approaches the subject, the wider and more intricate become the issues involved, and the more puzzling and difficult their solution. The factors that go towards the causation of tuberculosis, the different modes of the spread of the disease, the sources and degree of infection,

the part played by the tubercle bacilli and other organisms, the attitude of the human organism towards the microbes, the various means of cure, the social and economic agencies set in motion towards its prevention—all these problems are so complicated and interwoven that it is impossible to come to any definite understanding concerning them from the present state of our knowledge. The difficulty is further increased by having to deal with two, if not more, types[1] of tubercle bacilli, their relation to each other, and the relation of both to men and animals in their various degrees of virulence, resistance, and susceptibility.

The study of tuberculosis takes us back to the early history of a nation's life. Disease seems to be the outcome of man's nonconformity to his environment, without and within. The primitive man, while living the open-air life, was more or less free from disease; but as soon as he began to put on clothes and build houses he stepped into a new environment. Clothes made the skin sensitive to external influences, and thus man was deprived of Nature's protection. If tropical diseases be the outcome of bites of flies and insects loaded with bacterial and protozoal organisms, it is easy to understand that the skin, which is Nature's first line of defence, when softened by clothing, has opened the door to disease. Life in the open air gave the savage an immunity from disease which he lost when he built houses that shut out pure air and sunlight.

If disease be the outcome of civilization, **tuberculosis is distinctly a product of our social and civilized condition.** The cattle that roam on the mountains, the wild beasts and monkeys that live in the forests, are free from tuberculosis; but bring them into towns, and confine them in stalls and menageries, they die wholesale of consumption. The very contact of civilization deprives them of the immunity which they enjoyed in their free state. So is it with primitive man. Consumption is rightly called the white plague, and seems

[1] Lewis enumerates five different varieties of the tubercle bacillus, nine allied varieties, and two varieties of pseudo-tubercle bacillus (*American Medicine*, September, 1908).

to be unknown among the dark races of Africa. Millard says: 'I have excellent authority for saying that the disease is rare among the negroes in Africa, and in the interior is almost never known.'[1] 'Flick considers that prior to the advent of the white man—and especially the Englishman—consumption did not exist among the American Indians. Wherever England colonized, the Indians took the disease, so that in course of time it became even more prevalent among them than among the whites.'[2] 'It seems that the Indian was free from tuberculosis before his contact with the whites, living, as he did, in the open air and without alcohol. The fire water introduced by the white man (a most vicious, impure, cheap, and harmful form of alcohol) has certainly been a large factor—all the more for the reason that the whites have, through many centuries, rendered themselves comparatively seasoned with regard to the stimulant to which the Indian has not yet accustomed himself.'[3] So when the primitive African and Indian first changed their environment and took to European clothing and food and drink, and came into contact with European civilization, they succumbed to tuberculosis and other diseases, so much so that Dr. Gregory, the Medical Officer of Health for Cape Colony, states: 'Of all the diseases attacking the natives and coloured, tuberculosis is by far the most important. . . . It is now no longer possible to doubt that the disease bids fair to decimate the native and coloured races.'[4]

The progressive changes in the evolution of man from pastoral and agricultural to commercial and industrial life were marked by an increase of wealth and comfort on the one hand and an increase of responsibilities and cares on the other; as civilized man further extended his conquests and widened his sphere of commercial enterprise into other countries, great upheavals took place in his physical and moral environment for which he was not prepared. It is this failure to meet new conditions and adapt himself

[1] 'Consumption and Civilization,' by Dr. John B. Huber.
[2] *Ibid.* [3] *Ibid.*
[4] *British Medical Journal*, February 15, 1908, p. 380.

to successive changes that has brought about social and economic evils which have accumulated with each generation. In his pursuit of wealth and pleasure, ease and comfort, man has departed further and further from Nature and natural modes of living. Towns have attracted the country people, and factories have become filled with men, women, and children. The cultivation of the land has been more and more abandoned; towns have become overcrowded. Competition has followed on the heels of commerce, and with it poverty and alcoholism. Factory life has turned men and women into machines, and has broken up the family through its members having to work late and long to obtain often a bare livelihood, and industrial diseases have increased in number and variety. Thus the empire has grown at the expense of the health of the people, and civilization has become hopelessly mixed up with poverty and wealth, struggle and competition, slums and overcrowding, drink and degeneration.

In such an atmosphere, the body and mind of man being cramped, the women bent with overwork, the child dwarfed with underfeeding, disease has found the most congenial soil for its growth. Man has disobeyed the voice of Nature; spurned her best gifts; held fresh air as poison, to be kept rigidly away; depleted the country; filled the towns to overflowing; and has spent half his energy in creating evils and the other half in trying to remedy them.

This wrong living, carried on for centuries, the inheritance of ages of strenuousness and mental strain, the curse of riches and poverty, of overcrowding and underfeeding, of misery and despair, have weakened his vital energy and undermined all those forces and virtues that make for peace and happiness, and brought an instability and loss of resistance which has prepared the soil for tuberculosis and other diseases.

Long ages of civilization and hereditary influence have not only created conditions for the preparation of the soil. **In this altered atmosphere, the nature of the seed, the micro-organism, has also changed its character.** We will discuss

this question more fully in the third chapter. Here we will briefly state that the part played by the micro-organisms in the causation of disease is not yet fully understood. They have been with us since the beginning of things, and will be with us till the end of time. They are really our friends, and are invaluable in the service of man. They help us in the daily necessaries of life, as in the making of bread and cheese, of butter and vinegar, of tobacco and alcohol. We are dependent on them for various industries, as indigo, tanning, etc. They fertilize the soil and act as scavengers. They aid in the promotion of digestion and assimilation. But in the unhealthy and artificial environment which civilization has created they have adopted a new rôle; they have taken advantage of our weakness and lowered vitality, and have become abnormally active and virulent, and have pounced upon our flesh and blood to our destruction. Man's altered surroundings have changed their character; instead of being servants, to a great extent they have become masters. Just as Western civilization has disturbed the indolent peace which man in the East enjoyed for ages, and the importation of arms and drink among them has stirred up their hatred and hostility, so modern conditions of living have stirred up the peaceful slumber of the saprophyte, which has assumed pathogenic properties.[1] Even now, if our vital energy is

[1] Professor E. Ray Lankester, in his book on 'The Kingdom of Man,' says: 'It is a remarkable thing that the adjustment of organisms to their surroundings is so severely complete in Nature apart from man that diseases are unknown as constant and normal phenomena under those conditions. It is no doubt difficult to investigate this matter, since the presence of man as an observer itself implies human intervention. But it seems to be a legitimate view that every disease to which animals (and probably plants also) are liable, excepting as a transient and very exceptional occurrence, is due to man's interference. The diseases of cattle, sheep, pigs, and horses are not known except in domesticated herds and those wild creatures to which man's domesticated productions have communicated them. The trypanosome lives in the blood of wild game and of rats without producing mischief. The hosts have become tolerant of the parasite. . . . So, too, it is probable that the sleeping-sickness parasite flourished innocently in a state of adjustment due to tolerance on the part of the aboriginal men and animals of West Africa.

not more or less impaired, they cannot harm us, and no plague or pestilence that walks by day or night can hurt us.

We go further. **Nature has prepared man even for this altered condition of the micro-organism**, so much so that it is a question if it be not intentional from the beginning, and form a part of evolution. Do they not play an important part in life's economy? If life is maintained by struggle and conflict, if the measure of life be the measure of resistance which the organism displays, do they not supply the conflict so that life may be strengthened and exercised? If the very existence of life depends upon constant exercise, and this exercise in altered conditions of health is maintained by the opposition of micro-organisms when they have become pathogenic, would they not keep alive life and its functions by compelling the organism to keep a constant vigilance through their presence and their toxins? The approach of bacterial organisms is the signal for calling out more leucocytes and phagocytes to the seat of attack. The presence of toxins is met by the creation of antitoxins. Thus the very presence of the enemy acts like a stimulant to the organism to put forth its best effort not only in defending itself from the encroachments of the enemy, but in destroying it after a contest.

Looked at from this point of view, disease seems to be Nature's effort to bring the prodigal back to health and restore harmony in the disordered house. Nature not only works to maintain health, but also when that health is jeopardized. It is only when she fails that the term 'disease' should be applied. For instance, inflammation does not, as was once supposed, indicate a diseased condition. We now know that it is Nature's first step towards repair and restoration. So that pathology to a great extent

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It was not until the Arab slave raiders, European explorers, and india-rubber thieves stirred up the quiet populations of Central Africa, and mixed by their violence the susceptible with the tolerant races, that the sleeping-sickness parasite became a deadly scourge—a "disharmony," to use the suggestive term introduced by my friend Elias Metschnikoff' (pp. 33, 189).

should be pushed back from its present position; or, better still, a buffer state should be created between the domain of physiology and pathology as the land standing between health and disease.

Continuing the same argument, we come to see that **the diseased conditions are in us, not outside us.** As it is true morally, so it is true physically, that we ourselves make or unmake our lives—that we carry within us potentialities for good or ill. We create the soil and give virulence to the seed. In our effort to deal with the micro-organisms we have forgotten man, the chief actor in the drama. In devoting all our energy to kill the microbes, it is like playing 'Romeo and Juliet' with Romeo left out. If man is well, bacterial organisms will be perfectly harmless, and will not hurt him. Cocci and bacilli may live side by side with tissue cells and leucocytes in the healthy organism without creating any disease. The seed will not grow if the soil is not prepared for its growth. Man makes the soil, and he speaks the last word in the production of disease, and even if the seed be virulent, the unfavourableness of the soil can nullify its virulent effects. There are two ways of dealing with a thief suspected of entering an unprotected and dilapidated house. One is to put a policeman in the house, to watch the movements of the thief day and night; the other way, which is surely the better, is to so fortify and strengthen the house and the householder within that there will be no possibility for a robber to enter, or, having entered, to do mischief. Thus the physician and statesman must change their tactics, and direct their efforts not so much to putting an end to the microbe as to strengthening the citizen by wholesome surroundings, physical and moral, so that it will be impossible for pathogenic organisms to implant themselves and harmfully affect the individual.

This brings us to the consideration of such words as 'vital energy,' 'resistance,' 'immunity,' 'susceptibility,' etc., which are so often used in relation to tuberculosis.

Life manifests itself, as we saw before, in movement and effort. **Life can be defined as one long effort to ever adjust**

itself to new environment. When struggle ceases, life ceases. The struggle of an organism acts like a stimulus to the secretions of various glandular and tissue cells of the body, creating strength or resistance, which renews the struggle, thus forming a cycle. A normal struggle creates a healthy stimulus, which in turn creates a healthy secretion of the cells of the body; while an unhealthy struggle would result in a wrong stimulus and perverted cell secretion, bringing about lowered resistance and loss of immunity.

Man requires constant stimulus for the performance of various physiological functions of the body. Yesterday's stimulus will not avail him much to-day, as yesterday's food will not carry him far to meet to-day's needs; so resistance should be constantly replenished. It is not a fixed quantity, but, like the mercury in the barometer, is constantly rising and falling, the fall and rise representing life in its cycle of struggle, stimulus, secretion, strength, and safety or immunity of the organism.

Somehow I cannot help believing that resistance only partially represents vital energy, and is not vitality itself. Vitality is outside man, and, like solar energy, comes from the great Author of all life. It is the free gift of Nature (Nature only represents the Source of all life), and, like fresh air, it depends upon our capacity to receive it. The capacity is modified according to environment. Man receives it according to his own measure. It flows in proportion as his vessels are kept clean.

The conditions for the free flow of the vital energy are twofold:

(*a*) **The body should be kept in good repair by food.**

(*b*) **The mind should be undisturbed.**

The food, by nourishing the body, keeps it efficient for the vital energy to flow through, just as we keep an electric machine bright and clean so that the electric energy may easily flow. We cannot create electric energy, and we cannot create vital energy. So vitality is outside our eating and drinking. If it were not so, the rich would have most of it, and the poor almost none of it. Just as the soldiers

that line the streets keep the roads free from traffic and obstruction, so that the King may pass without any hindrance, so the food keeps the body in good repair, so that energy may flow uninterruptedly.

Even food cannot put the body in an efficient state if the mind is disturbed and agitated. We may have a beautiful and perfect static machine, and every part of it kept in smooth polish and fine working order; and if there be thunder in the air, the machine cannot liberate electricity, because the electric conditions of the atmosphere are disturbed. Till calmness and equilibrium in the atmospheric condition are restored, the electric energy will not flow through the machine. So that calmness and peace of mind are necessary for the performance of secretion, digestion, and assimilation. The mother, while nursing her child, suddenly hears some bad news, and the flow of milk is disturbed in quality and quantity, and her own appetite fails, because the sudden bad news acts like a mental shock to the nervous system, which has interfered with the physiological functions for the time being.

Believe me, vitality somehow or other flows from the secret springs of calm and peace. Sleep is the symbol and expression of peace. It seems as if the Angel of Life comes in the silent hours of the night, and fills the empty pitchers of cells with vital energy which has been spent during the day; the night of weariness gives place to the restored energy of the morning. And in many a crisis health comes back on the wings of sleep. But the dreadful conditions of modern living are undermining the nervous system, bringing about a restlessness and an instability which are becoming a national calamity. If the sanatorium experience has burnt in one lesson more than another, it is that mental worry—gnawing anxiety—is the factor of factors in the causation of disease, and predisposes the soil to tuberculosis.

The health, therefore, of an individual or a nation is brought about by perfect adjustment to environment. When there is peace throughout the regions of the organism,

all the physiological functions of the body are carried on smoothly, the expenditure of the body is replenished in the night, and life flows through the various channels bringing health, and even when there is a slight disturbance, the organism swings back again, and peace is restored. Nature is thus constantly adjusting herself, and is constantly restoring to health. Hence she has cured thousands of cases of pulmonary tuberculosis in her secret hospital in her own way without the slightest knowledge of the patient or the physician. It is only when the disturbance becomes chronic, and the cords of mental strain are tightened round the organism by unhealthy environment, such as poverty, competition, unemployment, etc., that the disorder becomes more or less permanent. The patience of Nature is so great that even now, if man would take her warning, she would restore him to health, though the scar would remain. But only when he refuses to obey her repeated warnings, the natural defences of the body become weakened, and degeneration and death sweep over his organism.

If disease is brought about by departure from Nature and her laws, health can only be restored by retracing our way to her. The so-called uncivilized man is a true child of Nature, and understands her moods. But the civilized man is proud and irreverent, and thinks he knows better than Nature, and is constantly striving to improve her methods and means. In the early stage of pulmonary tuberculosis she does not want our help, and in the last stage our help is of no use. It is only when the condition of disease is between the two stages that our help can be of use, if we know how to render it. If she cannot cure, it is a question if we can improve upon her methods. Do we not, by interfering with her laws and by patching up the unfit and the castaways, swell the army of the degenerate, who directly and indirectly cripple the nation's efficiency? On the other hand, when she brings about a cure, she does it effectually, though she takes time over it. The immunity she creates is real and permanent, while man creates an artificial immunity which is neither lasting nor satisfactory. Hence the secret

of success of the open-air treatment, which follows Nature's methods, and seeks to create a natural immunity in pulmonary tuberculosis and other diseases. In the author's experience of ten years, he considers that no method of treatment has brought about such permanent and satisfactory results as the treatment of consumption on open-air lines.

This calls into question the whole procedure of modern methods of treatment in contrast to the simple and natural means which the open-air treatment has inaugurated.

One of the chief characteristics of the age is the great development of physical sciences, and their practical application to commercial and industrial life. Medicine has shared the same tendency in elaborating physical methods in the diagnosis and treatment of disease. Time was when the physician was trained in hearing and seeing, and his powers of observation and intuition were so developed that he gave a more or less correct diagnosis by the bedside. **Now the centre of attraction has shifted from the bedside to the laboratory of the pathologist,** who decides the fate of the patient miles away as to whether or not he has consumption by the presence or absence of tubercle bacilli in the sputum. But surely it is a mistake to depend upon the laboratory methods alone for our diagnosis of pulmonary tuberculosis, for in more than 30 per cent. of cases of patients admitted to our sanatorium suffering from consumption tubercle bacilli could not be demonstrated. So the presence of Widal's reaction does not always indicate that the patient is suffering from typhoid fever. In doubtful cases—the very cases concerning which we are anxious to have a definite answer—serum diagnosis cannot be entirely depended upon. The physician can detect through the stethoscope early physical signs of pulmonary tuberculosis long before the pathologist can demonstrate the bacilli under the microscope. As civilization tends to impair the eyesight and narrow the physical vision, so the exclusive dependence on physical methods for diagnosis and treatment is likely to lessen, if not put an end to, all those powers of intuition and observation,

and those inner perceptions which open into the infinite and give a wide outlook and true perspective of life.

Further, the results of artificial experience made on animals cannot truthfully represent what is going on in the living body in its natural state, because they are produced under artificial conditions, and are not true to life. How can we reasonably take a hundred washed leucocytes from the blood, and interpret their action on bacteria as what is going on in the body in the living state? Cells and serum are only the conveyers of life, receptacles, not the source of life. By severing the leucocytes from the body you cut them off from the sources of life.

Also the results of experiments on animals cannot truthfully represent what takes place in the human body. Man is infinitely separated from a rabbit or a guinea-pig by the boundless activities and resources of the mind, which controls all the physiological and pathological functions of the body. The present-day tendency to ignore the influence of the mind over the body, and the operation of the subtle and invisible forces in man, is a grave defect, and seriously vitiates all laboratory experiments and their results. If man were mere body, the methods of diagnosis and treatment worked out in the laboratory would be both rational and legitimate. But man is more than body, life more than serum and leucocytes. The processes of life cannot be rightly interpreted by the test-tube from the laboratory. We can no more measure the index of vital resistance by physical methods than we can weigh thought by a pair of scales. The world is larger, the roots of life lie deeper than can be seen by the pathologist or his microscope. The more we know, the more we realize how little we know; how vast and infinite is that which is beyond us. All the greatest forces of the earth are silent and unseen. Just as the most important part of the tree is buried under the surface of the earth, so the best part of man is that which cannot be seen or handled. The tender instincts and intuitions of the mind that come to man like the soft breath of summer are more real than his visible body. It is from the stepping-stones of scientific certainty that we climb

to see the land of uncertainty. Like science and philosophy, the visible and the invisible, the knowable and the unknowable, go to make up the whole truth.

This is why science and philosophy should go hand in hand in search of the unknown realms. This is why the pathologist should also be a philosopher, and his work should be controlled by the physician working at the bedside. The more the physician becomes dependent upon the pathologist for his diagnosis and treatment, the greater will be the tendency of the pathologist to become dogmatic in his assertions. Creed and dogmatism have in the past destroyed the life of true religion, and so they will kill the spirit of progressive medicine. We should set up no gods, nor make idols of any men, however great and eminent they may be. While grateful for their lead and guidance in the pursuit of truth, we should only use them as stepping-stones to mount higher, to get a broader outlook, a wider glimpse of life. True science is ever progressive. There is neither finality nor an abiding place for her. She is ever marching forward, ever moving her tent from place to place, the evening finding her nearer truth than the morning, though the goal is ever so far in front of her. This continuous struggle and search after truth is part of the plan of life by which the organism is kept in constant exercise and healthy development.

It is not by injections and inoculations that the final triumph over disease will be achieved. Vaccine and serum therapy are only a half-way house at most. We have many leagues yet to travel to reach the goal of medicine—viz., the prevention of disease. Evolution is moving humanity forward from cruder to higher life, and the physician should keep pace with the times, and equip himself with more and more refined methods in his treatment of disease. Already our remedies have changed from cruder to finer forms. Bleeding is gone, drugging is going; electric treatment, with all the mysterious forces allied to it is already to the front, and psychic treatment is coming forward for serious consideration. No treatment in the future will be deemed

permanent or satisfactory which does not recognize the psychic element of man. The ancient Brahmins combined in their persons the offices of physician, philosopher, and priest, which represent the functions of the body, the mind, and the spirit. We are just beginning to tap the mind forces in the treatment of disease, and the spirit forces are still beyond. If the medical profession would lead humanity aright in future, as it has always done, it would not be content to live in the lower planes of physical treatment, which is cramping its sphere and usefulness, but would rise with the trend of the times, and learn to make use of those psychic and mental powers for bringing about the healing of body and mind.

What has all this to do with tuberculosis and the open-air treatment? A great deal. Behind the visible factors that make for consumption lie the root-causes of worry and anxiety, of mental strain and fatigue, of restlessness and instability. And it is only by bringing calm and peace to mind and body that disease can be tracked to its deepest lairs and be destroyed. Peace and calm of mind spell health of body. This is why we read that the great Master healed the body by speaking peace to the inmost soul. The civilized man has lost the secret of peace. While he has multiplied riches and comfort, he has also multiplied care and disease. **And open-air treatment has taught this precious lesson—that it is only by going back from the bustle and excitements of town life to the calm and communion of Nature that man will regain his lost peace and health.** The secret of the real strength and happiness of an individual lies surely in the simplicity of his life and the fewness of his wants.

If mankind is to progress in the future towards the achievement of its ultimate aim—the prevention of disease—it will move in the following directions. It will strive towards removing all those evil conditions which predispose the body to disease. This creation of a healthy environment by return to Nature and to a simple life will enable the forces and powers of the mind to exert their healthy control

over the activities and functions of the physical body, and the harmonious working of body and mind will bring about peace and health. The open-air treatment has given a right lead in this direction. If man would only learn the full meaning of the movement, and follow the footsteps of Nature in humility and reverence, it would lay a foundation for a great reform. It would bring about a revolution in the social and national life as momentous and far-reaching as the idea of evolution created in the scientific world.

CHAPTER II

THE PREDISPOSING FACTORS OF TUBERCULOSIS

'The past still travels with us from afar,
And what we have been makes us what we are.'

As pulmonary tuberculosis is a widespread disease, claiming its victims in almost every part of the world, among all classes and ranks of men, the investigation of its causes must also be extended over a wide area. The factors that contribute to the ætiology of tuberculosis, like the roots of a tree, lie deeper than can be surmised from the surface. We have seen that conditions of civilization involving toil and struggle, care and anxiety, have laid the foundation for tuberculosis and other maladies.

Heredity.—Next to civilization, we come to hereditary influence. Although in some quarters there is a tendency to minimize the evil effects of heredity, I believe it is an important factor in the predisposition of tuberculosis. For good or ill, physical or mental impressions can be transmitted from parent to offspring. If not direct from the parents, the impressions may be transmitted from side-chains or collateral branches. If physical characteristics, such as malformations, digital defects, etc., can be transmitted, why not other characteristics? It is one of the laws of biology by which the errors and defects of parents, such as alcoholism, syphilis, epilepsy, insanity, etc., can repeat themselves in their children. If the tendencies be intense, if the poison be strong, the disease itself may be transmitted;

if not, mere weakness of the tissues may be handed down. It is a very serious thing to contemplate that nothing is lost, that life goes on for ever, that we live in the lives of our children and their children's children, and that the seed that is sown, whether physical or moral, never dies, unless a stronger force of personality counteracts its evil effect and increases the good, or *vice versa*. Whether the difference in the transmission of the poison or characteristic lies in the difference in the intensity of the poison or not, we cannot tell. Thus much we can surmise—that we form one of the links in the long chain that connects the past with the present and the future, and that we transmit the inheritance given to us as it is, or modified by our personality, to others that follow us. Of course, we are treading the dangerous ground of such doctrines as free-will, environment, etc. Man is not the creature of circumstance entirely. His personality or vital energy can neutralize any evil tendency, or add his quota to the good. But ages of civilization add to the intensity of evil and good, and make the battle between the opposing forces of personality and environment acute and terrible. We do not know all the laws that govern heredity. It is sufficient for our present purpose to know that we reap what our forefathers have sown; that if the harvest is not reaped in one generation, the next may not escape. If the disease itself is not transmitted, the offspring may inherit a vulnerability, a degenerated condition of the tissue which, with other factors assisting, prepare the soil for disease. A consumptive patient with a bad family history is in many cases handicapped, and his prognosis is not so bright as one with a good history, although the former can counteract the inherited weakness both by a healthy environment and a strong personality. It is because the better understanding of our environment enables us to cope with heredity, and nullify at least some of its defects, that its influence is sometimes ignored altogether. I know of two consumptive families where most of the children died of pulmonary tuberculosis between the ages of nineteen and twenty-five, although they were separated from one another by many

miles, and lived under different conditions. No doubt these are extreme cases. In one of these families a brother, and in another family a sister, escaped from consumption—which proves that the child of a tuberculous parent need not necessarily become a consumptive, and that it is possible for the children to escape and be strong, in spite of bad family history. Both the children who lived were younger members of the family. I have noticed this escape of the younger offspring in many instances. It looks as if the hereditary taint spends itself among the older children, leaving the younger free; or perhaps it may be the easier circumstances of the parents, or a better knowledge of living during the birth of the younger members, enable them to have stronger personalities that save them from inheriting the taint. In some cases the hereditary predisposition shows itself in the slow and insidious development of consumption, which does not present a severe type, but persists in taking a protracted and chronic course.

The serious part of the story of hereditary predisposition is that when it is strong it weakens will and personality, so that the offspring may suffer in two ways—by the strength of the poison, and by the weakening of his vital force and energy. Long ages of drink and poverty, bustle and excitement, toil and anxiety, must tell upon succeeding generations with greater and greater intensity, preparing the soil more and more for disease and degeneration. But we must not fall into the error of thinking that, because heredity is a factor to be reckoned with, it cannot be overcome by good environment—at least, so far as tuberculosis is concerned, man is above heredity, and Nature can so work as to overcome many obstacles, and convert the inherited weakness into strength, if she has something to work upon. As the open-air movement becomes more and more a power for good, in creating a healthy environment in the social and national life, the influence of heredity as a predisposing factor of tuberculosis will become more and more weakened.

There is a close connection between tuberculosis and syphilis. Not only may both these conditions be present in

the same subject, but the syphilitic parent may transmit a weakness to the child which may develop into tuberculosis. When tubercle, syphilis, and alcohol are inherited together, the condition of the offspring is indeed terrible. Nature may, in mercy, intervene in such cases and stamp them out of existence. So also in some forms of insanity which end in tuberculosis, it looks, as Dr. Mott has pointed out, as if it is one of Nature's ways of eliminating the unfit.

Unhealthy Occupations.—The manifold development of arts and industries has brought into existence a number of ailments produced by them. The greater the growth of trade and commerce of a country, the more varied the occupation, the greater the increase of industrial diseases. Unless one has some personal experience, it is impossible to imagine the pollution of the atmosphere in the large mills and factories and workshops where thousands of men, women, and children spend a great part of the day. Daily working in such vitiated air poisons the system, which is made favourable to tuberculosis in two ways: the particles of various kinds of dust, etc., either irritate or wound the tender mucous membrane, and constant irritation tends to destroy the cilia that line the walls of the nose and air-passages, and bring about inflammatory changes in the mucous membrane and diminish cell resistance. The continual breathing of the poisoned and devitalized air lowers man's vital resistance on the one hand, and, on the other, favours the growth of micro-organisms, which feed on the organic impurities of the respired air.

Overcrowding, Slums, Poverty, Alcohol, etc. — The relation of social conditions to tuberculosis is further shown by the fact that it is more prevalent among the poor, who are the victims of a cycle of evils. All civilizations accentuate poverty on the one hand, and wealth on the other. All important cities like London, Paris, Berlin, and New York, are full of problems of pauperism and the unemployed. The gradual migration of the country people into towns, in the belief that they can obtain more comfort and better wages, the dependence of Great Britain upon foreign markets

for its daily supplies of food and necessaries, the want of cultivation of large tracts of country, the dulness and torpor of country life, the luxury and attractions of town life and society—all have tended to deplete the country and overcrowd the towns, where the increased demand for accommodation has inflated the prices of house rent. Consequently, the poor people with fixed incomes have been forced to occupy more and more limited space; hence the origin of overcrowding, slums, and tenements, where submerged humanity ekes out its existence under the most unhygienic conditions. Add to this, the towns are experiencing increasing difficulty in finding work for those who are constantly pouring into them; and when in times of trade depression and for other economic reasons a mass of labour, skilled and unskilled, is thrown out of work, the situation becomes worse, making livelihood precarious and uncertain. Hence poverty follows unemployment, which increases competition and helps the creation of long hours, incessant toil, and sweating wages. From living in such an unhealthy and depressing atmosphere the workman seeks relief in drink, and tries to drown his troubles and stimulate his flagging energies by spending his last penny on alcohol. But indulgence in alcohol only increases poverty and unemployment, while it weakens the power of resistance and opens the door to tubercular infection. Thus a cycle of evils is created, which begins with overcrowding, and ends in underfeeding, misery, and wretchedness. The cords of life are strained to breaking-point, and impaired nutrition follows impaired resistance, which opens the door to tuberculosis and other disorders. The wonder is, not that so many fall victims, but that so many escape. There must be something behind evil environment and micro-organisms that controls life and health. What is it? We shall discuss this point later on; meanwhile, we see that civilization tends to create two evils—poverty and plenty. Both bring about inefficiency—the one by draining the system, the other by clogging it. Under both conditions lies the spectre of anxiety—the anxiety to obtain wealth and keep it, and the anxiety to find work and keep it. The rich have an advantage

in that they can adjust themselves, by having at their disposal means and opportunities for rest and recreation and for restoring the body, while the poor sink under their vicious surroundings. Hence tuberculosis is more common among the poor than among the rich.

What about the middle classes? They have neither the consolations of the rich, nor the sympathy and assistance given to the poor. In the attempt to avoid poverty and aspire to be rich, many of them are caught between the two mill-stones. To keep up appearances and to obtain the comforts of life they work all the harder, suffer from keener competition, and spend more nervous energy than either of the other two classes. Hence, exhausted by overwork, their struggle for existence is just as severe, if not more so, than that of the poor; and so many fall under the mental strain and fatigue, which prepare the soil for pulmonary tuberculosis and other maladies.

CHAPTER III

MICRO-ORGANISMS IN HEALTH AND DISEASE

THE soil having been prepared by unhealthy environment created by various conditions of civilization and hereditary influence, and further enriched by the undermining of the nervous system, we come to the last of the predisposing factors of pulmonary tuberculosis—viz., tubercle bacilli.

Our ideas concerning the micro-organisms in relation to man and animals are far from complete, and require constant revision according to the knowledge of the day, and should be studied in a broad, comprehensive, and philosophic manner to get their true perspective. Before going into the question of tuberculosis in relation to tubercle bacilli, it would be well to make a brief survey of bacterial organisms in general, and study their connection with the life of man in health and disease.

Micro-organisms, the lowest forms of vegetable cell-life in existence—perhaps coeval with, or prior to, the coming of man into the world—found everywhere in the atmosphere, in the water, in the soil, in vegetable and animal life, **play an important part in Nature's economy.** They bring about putrefactive changes, breaking up complex substances into simple ones for the growth and nourishment of vegetable and animal life. They cause fermentation, and help the baker, the farmer, the dairyman and the cheesemonger, the weaver and the manufacturer. They ripen cream and cheese, soften meat, give flavour to butter, help to form vinegar and alcohol, peat and coal; aid in the various arts and industries like tobacco, indigo, and in the manufacture of linen, leather,

etc. They purify sewage, act as scavengers by decomposing vegetable and animal matter, fertilize the soil, nourish the plants with food, and ripen fruit. They also act as living ferments in the body, and take part in the physiological functions of digestion, assimilation, and excretion. In fact, we are entirely dependent upon their service in our daily life. So valuable are they in Nature's economy that life would cease to exist if their help and co-operation were withdrawn.

If Nature has made them so indispensable to life in normal states of health, what is their relation to man in conditions of disease? There are three ways of looking at the micro-organisms in their relation to man in disease.

1. **Some microbes are harmless, and are agents for good** and beneficial to life and health; **while others are pathogenic bacteria**, and hurt man in various ways, causing specific disease when they enter and develop in the body. This way of looking at the micro-organisms resembles the moral theory that some men are born good, and others have bad and vicious natures from the beginning.

2. **Micro-organisms begin their life as saprophytes,** and help in various natural processes of life; but vicious environment changes their character, so that they take on new properties and become pathogenic. In the same way man has potentialities for good and ill, the good or bad predominating according to the environment in which he is placed.

3. **Micro-organisms play an important part in health and disease.** In health they serve man in various normal activities. In disease also they help man to regain his health, for their very opposition stimulates the system to secrete anti-bacterial substances which neutralize their toxins —in the same way that summer and winter, good and evil, prosperity and adversity, are beneficial to man—both conditions playing their part in developing his moral life and character.

The first proposition is becoming more and more untenable in the light of the present knowledge of pathology.

Bacteriologists are veering round to the second view, **that saprophytes are really identical with pathogenic bacteria,** and that 'the specific modes of activity must be regarded as depending upon certain alterations in the putrefactive process.' Lehmann and Newmann contend that 'the division of bacteria into pathogenic and non-pathogenic, etc., as is still always done in textbooks, has failed absolutely. We can understand and know the pathogenic varieties only if we study simultaneously the non-pathogenic, from which the former have once originated.' Professor Adami, of Montreal, takes the same view when he says, 'From having been perfectly harmless, they are now pathogenic and can set up disease.'

It is well known that the various forms of cocci which are found in the air, in the water, on the clothing, on the skin, in the saliva, in the mouth, in the alimentary canal, and in many other normal tissues in man and in animals, and which are perfectly harmless under certain conditions, become possessed with specific properties, and give rise to septicæmia, pyæmia, erysipelas, abscesses, and other pus formations and septic infection.

It is also known that pneumococci, which the writer has often demonstrated in the mouth and the throat of healthy persons, doing no harm for months, under some abnormal stimulus take on new activities, and enter the system, causing various diseases affecting the respiratory, the circulatory, the gastro-intestinal, and the cerebro-spinal systems. They give rise especially to pleurisy, pneumonia, and endocarditis. So also it is demonstrated that harmless coli bacilli, which are found in the fæces of healthy animals and healthy suckling infants, under some exciting causes become virulent, and cause diarrhœa and other gastro-intestinal affections. Instances can be multiplied which go to prove that bacterial organisms derived from a common source, and which in an ordinary healthy state take part in normal processes of life, under a new set of conditions or a modification of soil transform their properties, so that they become pathogenic, differing in their virulence according to their environment, and bring about specific diseases.

Under what conditions do they acquire virulent properties? It has been observed that **stimulating food and altered conditions of existence tend to increase the fertility of an organism.** This is why domestic animals, freed from the anxiety of finding food, and with regular feeding, are more prolific than their wild comrades in the forest. Investigations carried out by the Highland and Agricultural Society of Scotland have shown that when the ewes were fed upon turnips, oats, dried grains, and other artificial food at the tupping time, and for about three weeks previously, the percentage of lambs per ewes (*i.e.*, the number of lambs per hundred ewes) was found to be considerably in excess of the average percentage for flocks which received no special treatment, while the percentage of barren ewes was generally appreciably less.[1] Farmers and sheep-breeders have made practical use of these facts, and have increased their flocks. These and similar experiments show that increased nutrition has an immense influence in increasing the fertility of an organism. Again, micro-organisms grow luxuriantly in the cultivation of artificial media, where there is generally plenty of nitrogenous matter for them to feed upon. We also know that the country air, as compared with the town, contains very few germs, which are mostly of a harmless kind; whereas the air in a crowded and ill-ventilated room, situated in a thickly populated city, is full of bacterial organisms, some of which are virulent. The town microbes, like the domestic animals, find a suitable environment in which to grow. They feed upon the organic impurities of respiration and other decomposing matter so prolific in the overcrowded towns. Whether the changed conditions of existence have so altered the character of the tissues as to bring about chemical changes which lower the vitality of the organism they meet, or the lowered vitality of the organism, meeting the changed environment of the microbes, favours their growth and virulence, it is difficult to tell. Both views may be right.

The micro-organisms grow in virulence as well as in

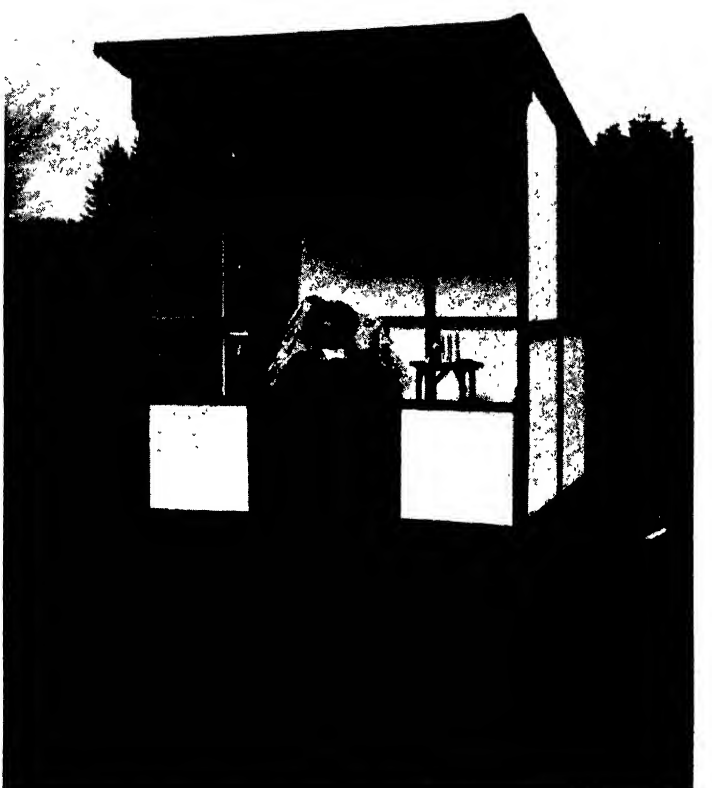
[1] Dr. F. H. A. Marshall, in *Science Progress*, January, 1908.

number. (*a*) It is an ordinary observation that the risk of contagion of specific fevers is much greater in the overcrowded and dust-laden town than in the country, where men like farmers, gardeners, and others, are comparatively free from disease. Here the changed conditions of the micro-organisms suggest that they have become virulent to cause disease.

(*b*) The New York Pneumonia Commission found that pneumococci obtained in December were very virulent and killed mice, while in April the organisms were much less virulent, so that they produced no effect whatever; and that if they were exposed to direct sunlight they rapidly died, which shows that the dark days of December favoured the growth and virulence, which were destroyed by the stronger rays of the April sun. Moreover, the same Commission observed that in the large cities of the United States, like Chicago, pneumonia had shown a great increase and mortality, once more proving that the conditions of modern town life favour an increased virulence and spread of infection. It may be that greater facilities for travel and communication in trams, railways, etc., and more frequent contact in the towns, give an opportunity for the micro-organisms to change their host, and thus have a longer lease of life; and this change may increase their vigour, just as it is proved that the virulence of tubercle bacilli can be increased by passing them from cattle to cattle.

(*c*) Dr. Palier, of New York, in the course of experiments to prove the toxicity of intestinal bacteria, injected into mice intraperitoneally fresh agar cultures of coli bacilli obtained rom the fæces of mice (fed on bread and water) and of suckling infants, and found that there was no effect whatever. But the same mice died within twenty hours when injected with coli bacilli obtained from a culture of meat artificially digested with gastric juice. Also a six-weeks-old agar culture, obtained from the fæces of a man (who was a great meat-eater) suffering from enteritis due to coli bacilli, injected into a mouse caused its death in twenty hours. After making many similar experiments, Dr. Palier concludes that 'the

PLATE II.



AN ISOLATION CHÂLET.

To face page 26.

non-virulence of the coli bacilli obtained from the fæces of mice and from that of a suckling infant was due to the fact that such fæces are deficient as a nutrient medium, and that the coli bacilli, in order to attain virulence, must have a medium of dead flesh.'[1]

Dr. Palier quotes Dr. Nicholas Senn, who, while visiting the hospitals in towns on the East Coast of Africa, was informed by the physicians there that they had never come across a case of appendicitis (most, if not all, the cases of appendicitis are due to coli bacilli) among the blacks, who lived on a fruit and vegetable diet. The writer also found the same experience among the Brahmins of India, who are strict vegetarians. Besides, the offensive odour of the fæces of carnivora, like cats and dogs, is not noticed in animals fed on fruit and vegetables, and is due to the formation of indol and skatol, the poisonous by-products of coli bacilli.

Putting all these facts together, we come to the following conclusions:

That harmless microbes living a natural life of saprophytes can take pathogenic properties and cause disease.

That this change in the microbes seems to be brought about by a change in their environment, which alters their constitutional properties.[2]

That this altered environment is greatly the outcome of the conditions of civilization, and may be provoked by many factors, these being chiefly—

(*a*) A lowered vitality, caused by a wound, previous disease, overcrowding, physical and mental strain, and other evils of modern town life.

(*b*) Increased nutrition, rich living, undue consumption of nitrogenous matter.

[1] *New York Medical Record.*

[2] The ability of bacteria to form pigments, fermentation products, and poisons, and to provoke disease, is proved by accurate investigation to be simply a quality of adaptation ('The Principle of Bacteriology,' by Professor Hueppe, p. 144).

(*c*) Foul air, charged with organic impurities, and other insanitary conditions.

(*d*) Frequent contact with people in towns and cities and in ill-ventilated buildings, etc.

The country people eat more simple and wholesome food and less meat, take more exercise, live more in the open air, come into contact with few people, go to bed earlier, and spend a less exciting life; whereas the town life, with its constant excitement, involving late hours, rich food and less exercise, and frequent intercourse with people in artificial and enervating surroundings, prepares conditions which offer a culture-field for the growth of micro-organisms within the system.

Cannot the foregoing considerations apply also to tubercle bacilli? **Is it too much to presume that they were once harmless germs, and have become pathogenic by a change of environment and nutrition?** Professor Hueppe says: 'The so-called tubercle bacillus is not a bacillus at all from the point of view of bacterial classification, but a parasitic growth-form of pleomorphic mould.'[1] Professor Adami says: 'The tubercle bacillus, we may be fairly sure, from living, it may be, on foodstuffs outside the body, accustomed itself first to living on the surface and in the passages of the organism as a harmless saprophyte, and only later gained the power of living, not on, but in the tissues, and from that moment it became pathogenic.'[2] This change in the organism need not have happened centuries ago, as he supposes. There is no reason why this should not be going on now. The bacterial organisms, like other moulds, yeasts, and fungi, exhibit endless transitions and types in form and property. Therefore, to endow them with a permanency of existence and structure is contrary to the elementary laws of biology and evolution. No; just as in a school, and all the year round, children of all ages are found, from the lowest to the highest form, so it is not unreasonable to suppose that in every age the low forms of cell-life are found in all grades

[1] 'The Principle of Bacteriology,' by Professor Hueppe, p. 143.

[2] *British Medical Journal*, 1905, vol. i., p. 1135.

and variations, from the most harmless to the highly pathogenic. In fact, that this is so is proved by clinical experience. Professor Osler says: 'As is the case with so many germs, the more carefully they are studied, the greater are to be found the variations, and we have learnt to recognize varieties in the species pneumococcus which differ not only in their morphological characters, but in degrees of virulence.'[1] That this is true in regard to the tubercle bacillus there is not the slightest doubt. The difference in the clinical symptoms and progress of the disease in consumptive patients is at least partly due to various degrees of virulence of the bacilli.

Professor Dunbar,[2] after a series of experiments conducted over a long period, and with every care, has come to the conclusion that the bacteria are not an independent group of organisms, but, together with some of the yeasts and moulds, are stages in the life-history of green algæ. After obtaining a pure culture of a single-celled alga, and by modifying the culture medium by the addition of acid, alkali, or traces of copper salts, other organisms, generally bacteria, occasional moulds and yeasts, and even spirochætes, made their appearance in the pure culture. In this country, Dr. Bastian, who has devoted many years to the investigation of the origin of life, and who is the champion of the theory of archibiosis, says in his recent book:[3] 'Such bodies, as well as vibriones, cocci, streptococci, torulæ, and other germs of fungi, have appeared within our experimental vessels when they have been heated for from ten to twenty minutes to temperatures ranging from 115° C. to 130° C. These organisms, which we have seen to be living—which developed and multiplied—must, therefore, have been evolved *de novo*. What other answer is it possible to give?' The scientific world may not as yet be prepared to believe with him that bacteria can arise *de novo*. But it can find many reasons to believe in

[1] *Clinical Journal*, February 19, 1908.

[2] 'Die Enstehung von Bacterien, Hefen und Schimmel pilzen aus Algenzellen,' published by R. Oldenburg, Berlin.

[3] 'The Evolution of Life,' by B. H. Charlton Bastian, M.A., M.D., F.R.S.

heterogenesis, which may be very likely the explanation of the experiments of these two eminent men. At least, so far as bacterial organisms are concerned, evidence is overwhelming which goes to prove that bacteria which have a common origin in simple vegetable cell-growth can, by some modification of soil, be changed from harmless saprophytes into pathogenic organisms creating specific disease, etc. This fits in with the theory of auto-infection, which, as Dr. Dudgeon says, 'is universally regarded to be a common source of infection in man, and plays a more important part than infection from without.'[1] In this way we can understand Professor Koch when he speaks of 'spontaneous tuberculosis,' and Professor Hueppe when he says that 'tuberculosis occurs spontaneously in apes as well as in man and in cattle.'[2] From all these statements it is not unreasonable to infer that common forms of bacilli found in normal tissues are able to acquire, under man's changed environment, pathogenic properties, and spontaneously give rise to symptoms of tuberculosis, independent of any infection from without.

The third view of the relation of micro-organisms to life is not very difficult to believe. What if bacteria really play a beneficent part in disease, as they prove to be man's friend in countless ways by helping the natural processes of life? **As in health, so in disease, Nature has prepared herself for any contingency that may arise.** The defensive arrangements of the body against any intrusion of the enemy, the creation of antitoxins at the stimulation of toxins, show that they form part of a plan in evolution. Even when the friends have become enemies, Nature makes use of them in her economy. A certain amount of opposition is necessary for the healthy action of the cell. We do our best when we are faced with opposition. So Nature rises to the occasion, when the enemy is at the gate, by creating anti-bacterial substances to combat the action of the toxins.

[1] Horace Dobell Lecture, delivered for the Royal College of Physicians, November 12, 1908.

[2] 'The Principles of Bacteriology,' by Professor Ferdinand Hueppe.

For every toxin in the field she places an antitoxin. Thus the very presence of the micro-organism, which has become pathogenic, puts Nature on her guard, and helps her to keep constant vigilance. We can understand this part of Nature's purpose by studying the action of a General in the battle-field, who goes through a campaign according to a settled plan he has already formed, though he has an alternative in his pocket, should the original plan be not successful, but which he will not execute till the first has become a failure. So Nature has originally intended man to be healthy and strong, and to enjoy life in the country. But man, in the course of civilization, has created conditions which have interfered with the development of his physical and moral life, and encouraged the growth of his enemies, who have robbed him of much he held precious. Nature gives repeated warnings that if he disobeys her laws he will come to grief. He does come to grief, but she does not leave him. She tries to put him right, though her original plan for his health and comfort has been frustrated by his foolishness. She produces an alternative scheme, whereby she tries to combat disease by creating antitoxins. Even now, if man would help her, he would get back his health, though he may be crippled for life, like Jacob after his fight with the angel. Some, like the anti-experimentalists, believe in the original plan of Nature. Others, like the experimentalists, try to help her in her second plan of action. The former contend in this way: Help Nature in her first plan. We do not want the antitoxins, because we do not want the pathogenic microbes or their toxins. Put in your pocket the alternative plan. Get the people healthy by creating conditions of healthy environment, and inducing them to return to country life. Then disease will vanish. But the latter retort: It is foolish to talk of the original plan. Man has created the town and all its evils. He is diseased and dying. It is too late in the day to think of carrying out the first plan. The need for action is pressing. We must call into activity Nature's protective substances to fight the enemy who is at the door. Both are right in their way. Only we cannot be

constantly bringing out the alternative plan, for the goal of the physician should be, not palliative, but preventive treatment; else he will be satisfied with a partial success, which will lull him to sleep, and make him forget the main issue. He must aim at creating conditions in which it would be impossible for the micro-organisms to grow in number and virulence, and cause disease. In fact, we must convert the town microbes into harmless saprophytes by retracing our steps to the country. If it took years for the innocent organisms to acquire virulent properties, it may take years also for them to return to the life of saprophytes. At any rate, the ideal of modern medicine is to follow as far as possible Nature's original plan, and take all possible steps to prevent disease.

CHAPTER IV

THE RELATION OF TUBERCLE BACILLI TO TUBERCULOSIS

As our knowledge grows regarding the origin and nature of tubercle bacilli, we shall modify our ideas concerning their relation to tuberculosis. Meanwhile, there is a tendency at the present day to exaggerate the part played by the tubercle germs in the causation of tuberculosis. Instead of preaching Von Ziemssen's dictum, 'No tubercle bacilli, no tuberculosis,' it would be nearer the truth to say, **'No soil, no tuberculosis.'** For the soil or environment, as we have seen before, is almost everything. Without it, it would be impossible for the tubercle bacilli to implant themselves and cause disease. There are affections regarded as tuberculous, such as scrofula, where tubercle bacilli are not found. If we include the pretuberculous stage as part of the process of tuberculosis, then we cannot insist that the presence of the bacillus is necessary for the proof of tuberculosis. Clinically speaking, not only in the pretuberculous stage, but in the early periods of the first stage, the presence of tubercle bacilli cannot be demonstrated. They are no more the cause of tuberculosis than poverty or any other predisposing causes. If they were all to be destroyed by some means to-morrow, consumption would not be eradicated, as the predisposing factors that have made tuberculosis possible would still remain, and would help the growth of 'spontaneous tuberculosis.' On the other hand, tubercle bacilli alone cannot produce consumption if the soil is not made ready by other predisposing factors. **The soil much more than the seed controls the disease.**

CHAPTER V

MAN THE FINAL FACTOR IN TUBERCULOSIS

THERE are three conditions necessary for the development of tuberculosis—in fact, for almost all diseases: (1) Predisposing factors; (2) micro-organisms; (3) man, the organism.

1. **Predisposing factors alone cannot produce tuberculosis,** however bad they may be. The writer, while working in a poor and crowded district of North London, was profoundly impressed over and over again by the fact that men, women, and children living in the most unhealthy and unhygienic conditions possible escaped consumption. It may seem a paradox, but it is nevertheless true, that some of the most beautiful children, with auburn hair, rosy cheeks, and plump hands and legs, may be seen in some of the most poverty-stricken slum districts of London. Nature knows her own secret of how she keeps her children healthy and beautiful. It is well known—the writer can corroborate from his own experience—that the Jews living in the most insanitary surroundings are more free from consumption than their Gentile neighbours.

At the annual meeting of the British Medical Association, 1902, the writer reported three cases—all of them wives—who nursed their consumptive husbands all through their long illness.[1] While the husbands died, not one of the wives took the disease, showing that environment is not everything in the causation of disease. While lowered resistance, brought on by unhealthy environment, does not always mean tuberculosis, high resistance is no absolute proof against the

[1] *British Medical Journal*, November 1, 1902, p. 1421.

disease, as we know that pneumonia cuts short the lives of some of the strongest men, and well-built athletes have succumbed to consumption.

Heredity alone cannot induce consumption. Heredity produces two opposite effects. While it weakens the tissues, so that the offspring becomes vulnerable to tuberculosis, it has also the opposite effect. Some of the children of consumptive parents not only escape the disease, but are often strong and vigorous, as if they had no family taint or weakness. Just as in cases of rickety children Nature builds up a strong body-frame to more than make up for the deficiency, so also here, in cases of inherited weakness, Nature rises to the emergency, and creates in the children of tuberculous parents an immunity which converts their weakness into strength.

2. We can go further, and say that **even the tubercle bacilli, after they have become virulent, do not always produce tuberculosis.** Longcope and Fox, in the New York Pneumonia Commission, reported that they found some persons always had pneumococci in their mouths. As Dr. Graham Smith mentions, his records, and those of others quoted by him, clearly show that in the majority of healthy persons who have diphtheria bacilli in their throats the organisms are fully virulent, and do not tend to lose their virulence when persisting in the tissues of a healthy individual without giving rise to any pathogenicity.[1] So it is perfectly possible for persons to carry with them tubercle bacilli, typhoid, and other organisms, and still be free from the diseases arising therefrom.

3. **Then, what is it that gives the final determination to tuberculosis?** It is that something which is peculiar and inherent in each individual, something identical with the organism itself, that controls health and disease. We may call that something vital force which creates resistance and immunity and controls susceptibility. It is above man's reach and reckoning, like 'the wind that bloweth where it listeth, and thou hearest the sound thereof, but canst not tell

[1] *The Medical Press and Circular*, November 18, 1908, p. 549.

whence it cometh and whither it goeth.' The real cause of health or disease is what we cannot see. As the most important part of the tree is hidden in the roots below the earth, so the best and most important of man is invisible. The unseen creates and controls the seen. Life cannot be explained from a physical basis, and disease cannot be explained by physical agencies alone. Behind resistance is vital force, which is identical with man, the chief factor in the causation of tuberculosis.

The connection between vital energy and resistance can be explained in this way: If vital energy is represented by the income of a man, resistance would be the salary he gets for the daily work he performs—say £200 a year. But the salary does not actually represent all the source of his income, as he may have his wife's income and income from the investment of land, property, stocks and shares, etc. If he has a salary we know he cannot starve; he has something to live on. So where there is resistance there is vital energy, though it is independent of resistance, as the income is independent of a man's salary. **Resistance creates immunity,** and where there is immunity there is less susceptibility. If immunity is lost, susceptibility comes into play. But man stands above all these forces, related in one way and unrelated in another—controlling, vivifying all the processes of life, and casting his final vote towards health and disease.

What are the other sources of vital energy? The following instances will explain my meaning: A young lady was lying very ill with hæmoptysis in a sanatorium. While at home she looked after the three motherless children of her only brother, and was passionately devoted to them. The unexpected hæmorrhage came like a shock to her hope of recovery. She lay motionless, her spirits terribly depressed, and nothing seemed to move her from her lethargy. The physician, after trying everything, went near her and said that her brother's children wanted her, and that she must live for their sakes, and do her utmost to get well. The love of the children acted like an electric stimulus. She said

quietly, 'I will get well for their sakes.' And she did. Love and faith seem to be unseen forces that play an important part in mental an through it, in physical healing, and whose aid the physician would do well to invoke in the treatment of disease. This is the secret of faith healing, which may not directly effect a cure of an organic affection, but it may bring into operation higher forces which, by stimulating the normal functions of the body, help to restore health.

A medical man lay dangerously ill from pneumonia. His medical attendant, seeing the gravity of the case, gave up all hope of his recovery, and the patient's friends and relatives gathered round his bed to bid him the last farewell. But the patient felt that in spite of dreadful weakness he was not going to die. During the early hours of the morning he felt a rush of energy surging through his worn-out frame. After a long sleep he woke up, bathed in perspiration, and told the nurse that he felt better and asked for something to drink. From that day he began to improve. Every physician must have come across cases of patients who lay at the point of death, all hope of recovery having been given up, but who, to his surprise, were alive and well in the morning. After a deep sleep, the crisis seemed to have passed, and new life of healing energy came in at early dawn. Life is a mystery. It comes and goes at its sweet will, and is outside man's grasp or calculation.

Of two brothers (twins), born of the same parents, brought up under the same roof, eating the same food, living in the same environment, working in the same office, one had consumption and the other escaped. How is it? Where is the difference? It is something inherent and part of man. **It is his own personality which is outside the pale of environment or micro-organisms.** If environment controls man, man has the power of controlling environment and neutralizing any tendency, whether it be physical or moral. If it were not so man would be a mere machine, an automaton; virtue would have no reward and sin no punishment; goodness and evil would be meaningless terms, and life an unbearable enigma. No; man has to a great extent the

power to choose evil conditions and contract disease, or to conform to the good environment and keep health, physical and moral, though a healthy environment makes his choice easy. We may not understand the relation between the operations of personality and environment; but we do know that if an unhealthy environment is very bad, and the dose of hereditary taint is very strong—overwhelming personality —Nature kindly casts a veil over the offspring, and will not repeat the species. This is true in inherited syphilis, where the children die before and after birth. Also some cases of insanity end in tuberculosis, as if Nature intervened to cut short the sad life, and would not reproduce the degenerate type. But if personality is not overwhelmed, the organism can begin to neutralize the evils of environment, and proceed to repair the broken edifice. Though it may not succeed in completing the structure in its own lifetime, it will at least lay a foundation for the building of a new type. It may take many succeeding ages of personalities—getting stronger as ages pass—to clear the poison, as it took many generations to introduce it; but man is the predominant partner who speaks the last word in the causation of disease.

CHAPTER VI

THE COMMUNICABILITY OF TUBERCULOSIS

THE question of the communicability of pulmonary tuberculosis, the degree and channels of infection, the relation of tubercle bacilli to man and animals, and *vice versa*, bristle with so many difficulties that it is impossible to form any definite judgment from the data that are at present available. The source of our knowledge to elucidate these questions is mainly three: (1) Statistical; (2) experimental; (3) clinical evidence.

1. **Statistical evidence is often fallacious,** and cannot be entirely depended upon without great reserve. It can be so handled that it can be made to prove almost anything. Besides, statistics only increase the difficulty. For man is a living animal. Each life differs from another; as no two leaves of a tree are alike, no two patients are alike in age, temperament, family history, character, and surroundings, the extent of disease, etc., so that they cannot be all grouped together to prove anything with certainty. Men are not like manufactured bricks, which can be calculated to a mathematical certainty as to how many of them will go to build a wall. All the study of statistics can do is to enable us to form general conclusions drawn from a large number of cases.

2. **The tendency of the present day is to rely too much upon experimental evidence.** (*a*) An inference drawn from experiments performed yesterday is often doubted to-day, and would probably be discarded to-morrow. For instance, the inhalation theory as propounded by Koch, Cornet, and

others, is contradicted by the brilliant researches of Calmette, Guérin in France, and Whitla and Symmers in this country, who contend that in a great majority of cases pulmonary tuberculosis is not contracted by inhalation, but through the intestinal tract. As we are constantly viewing fresh sides of life, and fresh problems appear, we modify our views of the past by the wider knowledge and experience of the present. (*b*) Scientific experts themselves are not agreed in the results of their research work. They often arrive at opposite conclusions. This may be due to some error in their technique or in their judgment; or it may be due to their looking from different standpoints at the morbid processes which may present themselves in different ways. (*c*) Most important of all, artificial experiments made on animals in artificial surroundings cannot possibly represent what is really taking place in the animal's natural state. The experimented animals are either wild or tame. If wild, the very touch of man would fill them with fright, which would paralyze for the time being all their vital functions. The writer has seen rabbits die from sheer terror when caught alive. Using the animals for experimental purposes would cause a great shock to their system, which would interfere with their physiological functions and paralyze the efficiency of their defensive cells, thus enabling the micro-organisms to do their destructive work. Even the tame animals would suffer from disadvantages. Cooping them up in boxes and in cages, and feeding them artificially, must alter their environment, which would tend to lower their vitality. Besides, the shock produced by handling them and making a wound for inoculation, or for any other operation, would still further lower their vital resistance, making them an easy prey to the onslaught of the pathogenic organisms that have been injected. How is it possible to draw any right conclusions from experiments made under these circumstances? Moreover, as Dr. Bulstrode says, 'it should be borne in mind that the animals in most of the experiments referred to were highly susceptible to tuberculosis, and that the conditions under which infection is claimed to have taken place were probably far more severe

than any likely to occur in the everyday life of the average man or woman.'[1] Even if it were possible to experiment on animals in their natural state, how can we reasonably infer that the results obtained from them would equally apply to man? If lives of men differ from one another, how much greater is the difference between man and animals, which are infinitely separated from the human being. If the mind controls the physiological and pathological functions of the body of man, the absence, more or less, of the operations of the mind in an animal would be likely to vitiate the experiments and the evidence drawn from them, making the conclusions at most a probability, but not a certainty, when applied to man. So that the profession should be careful what value it attaches to the laboratory experiments made to find out the problems of tuberculous infection. The tendency of the want of recognition on the part of the Occident of the unseen elements of man, and of the mighty influence which the mind exerts over the body, is the fundamental source of weakness and error, which robs scientific research of its real value and meaning.

3. **Clinical experience,** observed by the physician in his everyday life, **is more reliable than either of the evidences we have been considering.** It may be divided, for the sake of convenience, into evidence from post-mortem examinations and from bedside experience.

Evidence from Post-mortem Examinations.—Professor Brouardel, recording his experience at the Morgue, in Paris, states that in necropsies made on the bodies of persons who had lived twelve years in Paris, he found that in 50 per cent. of such cases there were signs of old tuberculous lesions cured either by calcification or by fibrosis.[2] Lubarsch, in a report on the Pathological Department of the Royal Hygienic Institute in Posen, tells us that of 800 bodies which were dissected, 61 per cent. showed tuberculous lesions. Dr. H. Bertzke, of Berlin, says that of the adults who have died in

[1] Thirty-fifth Annual Report of the Local Government Board, Supplement, p. 49.

[2] 'La Lutte Centre la Tuberculose.'

hospital, some 70 per cent. show evidence of tuberculous changes. Bouchard, of Paris, puts the percentage at 75; Nägeli, of Zurich, at 90 per cent.; while Professor Osler says: 'If, as has been done in Ribbert's laboratory, a systematic inspection is made for the purpose, tuberculous lesions are found in practically 100 per cent. of the bodies of adults.'[1] These, and many other similar investigations, go to prove that tuberculosis is a very common affection in civilized countries, where almost every living person harbours tubercle bacilli at some time or another of his life, and that in a very large number of cases there is a natural tendency towards cure. So that it is not a question of where the tubercle bacillus can be found, but where it cannot be found.

Clinically speaking, what are the channels of infection? How does the tubercle bacillus enter the system? **Either by infection from without or from within.** Infection from without can be brought about by (1) inhalation; (2) by contact with persons suffering from tuberculosis; (3) by food.

(1) The reports of the Lille investigators are endorsed by Whitla and others, that in the majority of cases pulmonary tuberculosis is not contracted by inhalation.

(2) If pulmonary tuberculosis were a contagious disease like scarlet fever or small-pox, then consumptive hospitals and open-air sanatoria would be hot-beds of infection, and there would be evidence of the physicians, nurses, and others being infected by the disease. But what is the clinical experience? There is a remarkable history of immunity from consumption among the staff of sanatoria and consumptive institutions, some of which had been in existence many years before any idea of infection had led them to take special precautions. Dr. C. Theodore Williams, speaking of the Brompton Hospital for Consumption, London, says: 'The evidence of large institutions for the treatment of consumption, such as the Brompton Hospital, directly negatives any idea of consumption being a distinctly infective

[1] 'The Principles and Practice of Medicine,' by William Osler, M.D., F.R.S.

disease like a zymotic fever.'[1] At Falkenstein, during ten years, 225 non-tuberculous friends accompanying patients have stayed at the sanatorium; many have stayed for six months, and no case of infection has been observed. In America, Dr. Tradeau says that at Saranac Lake no nurse, attendant, or servant has ever contracted consumption.[2] My own experience agrees with those of the institutions above mentioned and similar others, which all tell the same tale. Omitting outdoor servants, such as gardeners, electricians, etc., who do not come into contact with patients, the number of doctors, nurses, maids, and other attendants employed during ten years in my own sanatorium was eighty-two, out of which in only three can I trace consumption, and these had it before admission. All three of them got well by leading the open-air life.

Now, coming to the question of probable infection among those who live in close intimacy, such as husband and wife, it is well to note Dr. Bulstrode's remarks: 'The knowledge of the widespread prevalence of tuberculosis suggests caution lest too great importance should be attached to seemingly positive instances of infection, while a large unrecorded volume of negative evidence is being overlooked.'[3] The researches of Dr. G. B. Longstaff do not support the contention that interconjugal infection is of frequent occurrence, while Whitelegge and Newman agree that 'statistics are inconclusive, even with regard to transmission of phthisis between husband and wife.' To cite my own experience of negative evidence, I must once more draw the attention of the reader to the three cases of wives who nursed their consumptive husbands all through their fatal illness. All three families lived in one of the congested districts of North London. The husbands were workmen, and each earned from twenty-five to thirty shillings a week. In one the family consisted of four members; in the other

[1] 'Geographical and Historical Pathology,' by Hirsch.

[2] 'Consumption and Civilization,' by John Huber, M.D.

[3] Supplement to the Annual Report of the Local Government Board, 1905-06, p. 72.

two there were five in each family. In each the house accommodation consisted of a sitting-room, a bedroom in which all the inmates slept, and a small kitchen. In spite of the many conditions that were favourable to infection, all the wives escaped contracting tuberculosis, and are living at the present day. So that I quite agree with Dr. Bulstrode that tuberculosis appears 'to possess the lowest communicability of any of the infectious diseases.' If ordinary precautions are taken for the disposal of the sputum, there is very small risk of personal communication, if any.

(3) The experimental results of Calmette, Guerin, Grysez, Breton, Whitla, and Symmers coincide with the clinical evidence that the risk of tuberculous infection by the intestinal tract is much greater than by inhalation or by personal contact. The intestinal infection is brought about by the ingestion of milk, butter, meat, etc. While admitting the possibility of tuberculosis being conveyed by milk, we must not shut our eyes to the fact that in countries where milk is not consumed tuberculosis is as common in children as where it is consumed. The theory of milk infection does not solve all the problems connected with the incidence and progress of tuberculosis in children. For—

(*a*) Dr. Duncan Main, of Hangchow, informs us that in China, where the consumption of the milk of bovines is practically nil, tuberculosis is everywhere prevalent among the natives.[1]

(*b*) Bruno Heymann, while discussing the relation of infant's tuberculosis to milk, quotes some other countries where no milk is consumed, but where tuberculosis is common. Japan (Kitasato): Perlsücht only introduced thirty years ago, whilst tubercle is very common. Greenland: No tuberculous milk, yet phthisis very common, and tubercular meningitis one of the commonest causes of death in children. Asiatic Turkey: Raw milk never drunk, even by adults; children breast-fed for two years; tuberculosis of all kinds very common and very virulent. Roumania: Children

[1] 'The Etiology of Pulmonary Tuberculosis,' by Sir William Whitla, the Cavendish Lecture, 1908.

breast-fed for a very long time; tuberculosis very rife, even in regions where there is no milk at all. Faroe Islands: Perlsücht only introduced a few years ago; tubercle of all kinds very rife for a long time. Egypt: Milk so dear that it is a luxury to the rich; tuberculosis very common, especially amongst the negroes and Berbers. Gold Coast: Children breast-fed, or fed on a concoction of palm-oil; tuberculosis of all kinds very rife.[1]

(*c*) Jorgen Thosen, of the Aas Agricultural School, mentions the fact that among thirty-one children constantly drinking unboiled milk from very tuberculous cows, 'not a single case of disease or death that could be in any way connected with tuberculosis has occurred during forty-three years.'[2]

(*d*) Dr. Overland, in a paper on the 'Investigations of Ninety-seven Norwegian Farms with Reference to Human and Cattle Tuberculosis,' says: 'Indeed, we find several instances where children have drunk unboiled milk from the stocks without being infected.'[3]

Infection from Within.—In many cases of tuberculosis no possible history of infection from without is forthcoming. There is reason to believe that infection from within is just as important a cause, if not more, of tuberculosis as the infection from without. And it can again be divided into **latent and spontaneous forms.**

Latent Form. — According to this form of infection, tubercle bacilli enter the system many years before they manifest themselves. They remain latent in some gland or tissue till some disease or some other cause lowers the vital resistance of the body, when they are roused into pathogenic activity, and give rise to tuberculosis. A distinct history of pleurisy or hæmorrhage some months or years before the actual onset of tuberculosis in many patients gives countenance to this view. Besides, I have noticed over and over

[1] The *Lancet*, August 8, 1908; *British Medical Journal*, January 9, 1909, p. 8.

[2] *Tidsskrift for den Norske Laegeforening*, 1902.

[3] The *Lancet*, August 8, 1908, p. 365.

again that some patients, after being in the sanatorium for a month or two, or longer, feeling well, and getting accustomed to living in hygienic and aseptic conditions of the atmosphere, develop more or less a high temperature, which persists for a while and then subsides. No possible cause, such as fresh infection from without, could be attributed to this rise. The only explanation seems to be that some of the bacilli that had been lying latent became active, and opened up a new focus of disease or disturbed an old one. The patient's organism, being in a better fighting condition, resents the invasion severely; the battle becomes furious, hence the high temperature. In some cases the intervals of quiescence are regularly or irregularly followed by periods of activity and rise of temperature, showing that, as one set of bacilli is disposed of, another set develops and gives battle, till, when all the sets of bacilli, as it were, are more or less killed or otherwise got rid of, the temperature becomes normal for good, and the patient recovers. Many of the phenomena that are clinically observed in the course of tuberculosis can only be explained by the assumption of the latency of the disease. The length of the latency depends upon the environment and the vital resistance of the organism. If the environment be unhealthy, and the resistance feeble, the micro-organisms would find a ready entrance, and set up morbid changes quickly in the system. On the other hand, if the organism is stubborn, and the resistance great, the microbes would remain latent for many months, if not years, by which time they would be surrounded and destroyed in their quarry, or undergo calcareous changes. Between the two extreme periods of latency the reader may imagine many varieties of conditions, depending upon the strength of the organism and the virulence of the enemy. Can we not in this way, apart from the consumption of milk, explain the behaviour of the disease among children, especially the poor, who live under such dreadful conditions and offer such feeble resistance that they quickly succumb under tuberculosis, the length of latency in their case depending upon their strength and surroundings, the

feebler falling more quickly than the stronger? The theory of infection of milk alone does not satisfactorily explain all the phenomena observed prior to, and after the onset of, the disease in the children.

By *spontaneous tuberculosis* is meant, as it has already been pointed out, that it is possible that common forms of bacilli which are found in the body under suitable environment change their properties and become identical with those of tubercle bacilli, giving rise to symptoms of tuberculosis. Between these two latent and spontaneous forms—*i.e.*, tubercle bacilli, entering as such (harmless or virulent) and becoming latent, and spontaneously forming from other forms of bacilli—there may be many degrees of variations, all tending to bring about auto-infection—*i.e.*, infection from within.

To sum up the writer's contention in this chapter: Nearly all civilized mankind suffers from tuberculosis. The tubercle bacilli are found almost everywhere; more in the towns and crowded districts than in the country. They may be harmless and take on pathogenic properties after they enter the body, or they may be virulent from the beginning. They get into the system by inhalation or by ingestion. If they are inhaled, those that are not destroyed by the cilia of the nose or the upper air-passages force their way through the naso-pharynx into the pharynx. It is round these parts that constitute the naso-pharynx—the tonsils and the pharynx—that the first line of defence is made by the organism; for the micro-organisms that enter the nose or the mouth must pass through these regions before they can enter the system. The congested and catarrhal condition of these parts in children and weaklings, leading to adenitis, tonsillitis, pharyngitis, etc., indicates Nature's repeated efforts to keep back the enemy. If the first line of defence is weakened, and the tonsils and the tissues around get chronically enlarged and lose their fighting efficiency, the bacilli make their way into the lymphatic system from the tonsils, pharynx, and deep cervical glands, or more commonly by the longer route from the tonsils, pharynx, the stomach,

the intestinal lymph channels, the thoracic duct, and tracheo-bronchial glands. Here, in the glandular tissue, they remain waiting for a favourable opportunity, in which case the patient not long after develops consumption; or months, or even years, may elapse between their entrance and the actual onset of the disease. By whatever channels (by inhalation or by ingestion—some of the inhaled organisms make their way into the pharynx and are swallowed with food) or forms (harmless or virulent) they may enter, the condition of the soil controls the development and progress of tuberculosis in the body. The question of infection depends upon two factors—the seed and the soil—the material to infect, and the person who comes into contact with it. The power of the tubercle bacillus to infect depends upon the organism. In other words, infection is conditional to the soil. The mere presence of the tubercle bacillus in the tissue does not indicate tuberculosis, any more than the presence of many forms of cocci in the mouth and the throat mean pneumonia, or scarlet fever, or erysipelas. Mere finding a thief along a street does not mean he is going to rob any house. As his breaking into a house is conditional to a favourable opportunity he may find—viz., an ill-protected house, and old and feeble inmates—so the infection of the tubercle bacillus is conditional to the resistance of the organism. If the tubercle bacillus is controlled by the soil or the predisposing cause, the soil is controlled by the organism. So man, through his vital resistance, speaks the last word in the causation as well as in the communicability of pulmonary tuberculosis.

CHAPTER VII

COMPULSORY NOTIFICATION OF PULMONARY TUBERCULOSIS

FROM what has been already said it will be seen that pulmonary tuberculosis is a chronic disease, and cannot by any means be regarded as a 'dangerous infectious disorder.' The word 'contagion' should not be used in regard to consumption, as it is not a contagious disease in the same sense as glanders or syphilis. It is the want of a better understanding of the character and behaviour of the disease that has led some medical men to join hands with some lay members of the community to demand its compulsory notification under the Public Health Acts. It is well to point out some of the objections against taking such a serious step.

1. As pointed out in the preceding pages, tuberculosis possesses a low degree of communicability, and if ordinary precautions are taken to insure proper ventilation and the disposal of the sputum, the infection will be almost nil.

2. When we come to consider as to who is tuberculous and who is not, the difficulty begins. Almost everyone living in the town is potentially tuberculous, and carries more or less some tubercle germs with him. Hundreds of cases that are not recognized or treated in life are spontaneously cured by Nature.

3. If the disease is to be recognized by its early signs, the general practitioner may not be conversant with what the specialist would consider early physical indications; and if

the specialists themselves differ, who is to decide that a patient is suffering from consumption?

4. If the presence of the tubercle bacillus is to decide the fate of a patient, then we are confronted with fresh difficulties, as the following:

(*a*) A patient may be suffering from pulmonary tuberculosis for months and years, and yet he may bring no sputum for examination.

(*b*) By the time the patient begins to expectorate, he will have passed all the periods of the first stage, and reached the second or softening stage.

(*c*) Even in the softening stage it is possible that the patient does not expectorate, as in cases of 'closed tuberculosis,' which is encapsuled, or which does not communicate with a bronchus, there is no sputum.

(*d*) A patient may expectorate one day, and not the next or the following days. The writer had a patient who stopped expectorating for six months, and then he brought a little just once, although he had well-marked disease all the time.

(*e*) In some cases of a late stage of the disease, in cases of cavity, or where fibrosis is most marked, patients do not always bring up sputum.

(*f*) Even when there is expectoration, tubercle bacilli may be found one day, and the next day they may either be absent or unable to be demonstrated. Two medical men examining the sputum on these two occasions will come to opposite conclusions. And who is to decide?

(*g*) In more than 30 per cent. of my sanatorium patients suffering from well-marked symptoms of pulmonary tuberculosis the tubercle bacillus could not be demonstrated. Would these be considered as tuberculous? If so, the sputum test would be of no use.

(*h*) In some cases tuberculosis runs a very chronic course, lasting for years. I have a patient who has been suffering for fourteen years, another twenty years. And how impossible it would be to subject such patients for so many years to all the penalties and disabilities which the enforcement of the Public Health Acts would entail!

5. If the advocates of the Act think that by making notification compulsory they would be able to deal with early cases, they are much mistaken; they cannot know human nature. The effect of the Act would be for patients to conceal their disease. They will not face the ordeal of being examined, if such examination let loose the terrors of boycott and ostracism. For some medical men have unwittingly played into the hands of panic-mongers, who have kept up an ignorant agitation, frightening people into thinking that consumption is a highly contagious disease, and that every consumptive is a hotbed of infection, to be avoided at all costs. The consequence of this absurd scare of infection will be that the public will shun the consumptive as if he were a leper or a pariah. It is bad enough now to get patients in the early stage for treatment. The loss of time and money, besides the inconvenience of leaving home and work, are so great that patients put off consulting a medical man or taking a decisive step for a long time; and if this Act were passed, it would give the patients an additional encouragement to suppress their disease longer still, till it might be too late for successful treatment. To prove that this is true in actual practice, I would cite an instance in my own experience. A young clerk went back to his office after being in my sanatorium for seven months, his disease having been entirely arrested. The morning he presented himself at the office his fellow-clerks consulted together, went to their chief, and petitioned him not to take my patient back, and that if he did they would all resign. The consequence was that he lost his situation, although, as he said, he was in every way much healthier and stronger than any of his companions at the desk. It so happened that one of his fellow-clerks was himself a consumptive, and had already made arrangements to go to a sanatorium to be treated. But the attitude of the others, and the treatment my patient had received at their hands, so terrified him that he abandoned all idea of leaving his place, and dragged on four more months, working away as if nothing was wrong with him. When he became too ill to work any longer, he went home, took to bed,

and died within a month. If compulsory notification were to become law, such cases would increase, and add to the suffering of the consumptive, who, besides being very sensitive, is already handicapped in life with a mortal disease.

6. Those who press for compulsion with the idea that it would help consumptive cases to be isolated, and thus stamp out the spread of the disease, forget that it is a moot question whether segregation would diminish the incidence of tuberculosis. Dr. James, in a paper he read before the Edinburgh Medico-Chirurgical Society, drew attention to certain curves showing the mortality from phthisis per 10,000 of the population between the years 1860 and 1905 in Aberdeen, Dundee, and Edinburgh. Here there had been only progressive voluntary efforts in individuals to improve the general conditions of life, and the results were as satisfactory as they were distinct. Another set of curves related to typhoid fever during the same period and in the same towns. The enforcement of legislative enactments did not appear to have improved matters as regards the disease. As regards measles, the curves showed that since notification and isolation the mortality had all over increased rather than diminished.[1] Dr. Killick Millard, in an article on the 'Influence of Hospital Isolation in Scarlet Fever,' says 'that hospital isolation of scarlet fever in towns appeared to have failed to reduce materially the prevalence of the disease as well as its fatality.'[2] Besides, the ratio of scarlet fever cases (in the jurisdiction of the Metropolitan Asylums Board) to population had increased from 3·7 per 1,000 in 1890 to 4·3 in 1906. If such be the case in regard to typhoid, measles, and scarlet fever, how can we expect that mere isolation would prevent the spread or cause the fall of the death-rate of tuberculosis? Dr. James Wheatley, the medical officer for Salop, is driven to the conclusion that isolation of phthisis in asylums and workhouses has not been a prominent factor in the decrease of phthisis in Shropshire during the last fifty

[1] The *Lancet*, July 18, 1908, p. 159.
[2] *Ibid.*, p. 160.

years.'[1] Besides, one should remember that the death-rate from pulmonary tuberculosis declined long before the introduction of notification, and 'has fallen in other places (which have not notified) in like or even greater amount, in the absence of any direct measures whatever.'[2]

The adoption of some such system as voluntary notification might prove useful, in that it would lead to preventive and educational measures being taken in insanitary areas, or to the removal from crowded tenements and unhygienic conditions of the consumptive poor, who have no one to look after them, or who may be in danger of infecting other inmates of the same room. But even the voluntary notification by the general practitioner presents dangers and risks when looked at, not only from a clinical and ethical, but also from a legal point of view. For, apart from the difficulties of rightly diagnosing an early case of consumption, and apart from the objection to the notification, for reasons given in the preceding pages, the medical man would be liable to incur serious damages if he wrongly notified a case or if his diagnosis, even though right, was not supported by other expert medical evidence. If a highly contagious disease like syphilis is not, and cannot be, notified for obvious reasons, it is not possible to bring consumption under the notification Act, especially when it is regarded as possessing only a low degree of infection. Any compulsion would do more harm than good. So that I agree with Dr. Newsholme when he says in his recent book that 'at present it would be inexpedient, unwise, and of relatively little use to advise the general adoption of compulsory notification of phthisis. Public opinion is not ripe for this step, and such notification would remain to a large extent a dead-letter.'[3]

[1] Supplement to the Annual Report of the Local Government Board, 1905-06, p. 245.

[2] *Ibid.*, p. 604

[3] 'The Prevention of Tuberculosis,' by Dr. Arthur Newsholme.

CHAPTER VIII

THE EARLY DIAGNOSIS OF PULMONARY TUBERCULOSIS

AN early recognition of pulmonary tuberculosis becomes more and more imperative as we realize the gravity of the disease and its ravages among all classes and conditions of men. The open-air movement in England has brought the subject of consumption into great prominence before the public and before the medical profession. During the last ten years it has roused the nation to see the serious nature of the disease, and has not only revolutionized its treatment, but has drawn a body of enthusiasts to give a closer study to the disease in its various aspects and symptoms. Medical men are beginning to see that in order to fight consumption successfully, the disease must be recognized and treated in its very early stages. But what is an early stage? The term is so vague and so glibly used that it hides a multitude of mistakes. The old classical division of pulmonary tuberculosis into first, second, and third stages rather than into consolidation, softening, and cavity stages, has served its purpose in the past, but it is not accurate enough either for scientific diagnosis or for successful treatment. I wish to call attention to the important fact that for early diagnosis and treatment we should from beginning to end depend almost entirely upon physical signs and symptoms, and that the trained ear of the physician should detect the presence of the disease long before any other methods of diagnosis could possibly indicate it. Before beginning to describe some of the early physical signs, I should like to say a

word on some of the other aids to diagnosis that are in vogue among members of the profession to-day.

1. **Tubercle Bacilli.**—Chief of these aids is the presence of tubercle bacilli. Koch's discovery of the tubercle bacillus is an important landmark in the history of the diagnosis of consumption. The medical profession hailed the discovery with great delight and enthusiasm, and accepted it as the one sure tangible proof of the presence of the disease. The relation of consumption to the tubercle bacillus has already been discussed. I said five years ago, at the annual meeting of the British Medical Association,[1] and I repeat now, that there is a great tendency at the present day to exaggerate the importance of the tubercle bacillus in the causation, diagnosis, and prognosis of pulmonary tuberculosis. Medical men so thoroughly believe in the tubercle bacillus as proof positive of the presence of pulmonary tuberculosis that they are becoming more and more dependent upon the bacteriologist for their diagnosis, and wait for their decision till the sputum has made its appearance. The consequence is that by the time the tubercle bacilli are demonstrated in the sputum, the patient has advanced well on the second stage, and hopes of an early arrest or speedy recovery are made increasingly difficult. Besides, there are conditions in which the bacillus cannot be found in the sputum. Tubercle bacilli cannot be found in acute pulmonary tuberculosis, in the early periods of the first stage of chronic pulmonary disease, in cases of 'closed tuberculosis,' in some of the cavity cases, or in later stages. In some children the bacilli cannot be demonstrated even if any expectoration can be obtained.

So that two things are evident—(*a*) Tubercle bacilli cannot be depended upon for early diagnosis; by the time they present themselves in the sputum a great deal of mischief has been done in the lung, and recovery is rendered prolonged and tedious. (*b*) Even in the later stages their presence cannot always be relied upon.

2. **Tuberculin.**—Medical opinion is not unanimous as to the value of tuberculin as a diagnostic agent. While

[1] *British Medical Journal*, November, 1902, p. 1421.

Hammer, Bandelier, and others, maintain the great value of the tuberculin method, Bowditch found no reaction after an injection of 10 milligrammes of tuberculin, though tubercle bacilli were found a few days after; and Schule quotes several cases where bad symptoms appeared after the injection, one of acute miliary tuberculosis, and another where undoubted tubercle gave a negative result. Hammer says that while the method gave 91 per cent. positive results, there are dangers, such as cardiac failure, dyspnœa, fever, hæmoptysis, and fresh extension of lung disease, etc., which may lead to the abandonment of the measure.[1] Dr. Edward Squire, physician to the Mount Vernon Consumptive Hospital, mentions that he has had three cases in which, with all the precautions which Wright has elaborated, tuberculin injections appeared to light up quiescent mischief in the lungs.[2] My own experience has not been very satisfactory. I remember two cases in which, after the injections, I had evidence of fresh congestive areas set up around the affected part, making the condition worse than before. I feel convinced that there is a distinct risk of tuberculin injection lighting up an old focus or rousing into activity any latent tuberculosis. Who can say that the injection would not turn the scale against the patient, in whom the disease would have otherwise remained quiescent? When we realize that a great many people living in the towns are potentially tuberculous, we can understand that a dose of tuberculin may, in some cases, be like setting a match to the fire that is already laid.

3. **Roentgen Ray.**—Much stress has been lately laid on the value of the radiograph as an aid to diagnosis of consumption. X rays cannot be relied upon for very early diagnosis, as by the time the diaphragm becomes restricted and unilateral in its movement—the earliest sign of pulmonary tuberculosis the radiogram can detect at present—the patient has passed into the late periods of the consolidation stage. Long before this physical signs would have made their appearance. X-ray

[1] *Medical Annual*, 1905, p. 461.

[2] *British Medical Journal*, June 15, 1907, p. 1420.

experts are not themselves agreed as to the value of this important sign of the restricted movement of the diaphragm, which is not present in all cases of early tuberculosis. If the X-ray apparatus and technique be so improved as to demonstrate the bronchial gland or areas of deep-seated infiltration, then we shall have in the Roentgen method a valuable means of making an early diagnosis, serving as an important help to other clinical symptoms.

4. **Opsonic Index.**—There is a certain amount of fallacy in regard to the opsonic index which vitiates its being depended upon for diagnosis. First of all, we have no right to assume that experiments on phagocytosis made *in vitro* really represent the phagocytic processes that are going on in the organism in its natural state. Secondly, there can be no such thing as a normal opsonic index. The variations of the index are great in the same person—in fact, the index in health shows so many fluctuations that it cannot be used as a standard for comparison. Thirdly, the technique is open to many errors. Saathoff[1] made two consecutive determinations of the opsonic index, and found that the differences obtained were beyond any allowable error in experimental or practical work. He says that the sources of these errors lie in the impossibility of preparing uniform capillary tubes, in the clumping of the leucocytes which hides the phagocytic cells, in the uneven sedimentation of the blood in the different capillary tubes, but especially in the biological peculiarities of the individual phagocytes, which lead to such marked differences in the number of bacteria taken up by them that even the counting of 200 cells cannot give useful averages. Thus the practical application of the opsonic index is seen to be greatly limited by the technical and inherent errors surrounding its determination. Similar difficulties and objections to Wright's method are raised by Dr. Charles E. Simon of Baltimore.[2] Fourthly, even if it were possible to obtain the right index, what does it signify? What is its correct interpretation? A low index need not mean disease

[1] *Münchener Medizinische Wochenschrift*, April 14, 1908.

[2] *Journal of Experimental Medicine*, September 21, 1907.

or want of anti-bacterial substances, or a high index quite the opposite. For Dr. Wells says: 'In infants a low opsonic index is not inconsistent with health, and the child may be thriving well with a declining index.'[1] I have seen patients who, after a stay in a sanatorium, were quite restored to health, having lost all their physical signs, and yet presented a low index. 'If it is a fact,' asks Mr. Watson Cheyne, 'that the anti-bacterial defence in infants does not depend on the opsonic content of the serum, and yet at this period their defensive powers are high, is it right to assume that at a later period of life the anti-bacterial defence does depend on the opsonic content of the serum? May there not be some other interpretation of the variations in the opsonic index than that which is put forward by Wright, and which is being so extensively translated into practice?'[2] The truth is that vital force or vital resistance is too subtle, too complex, to be able to be estimated by any known physical method. As a means of diagnosis the opsonic index is not reliable.

5. **Calmette's ophthalmo-reaction** is not an infallible guide in the diagnosis of early cases. While a positive reaction is not always obtained in known cases of active tuberculous mischief, it has failed to react in patients in whom the post-mortem examination afterwards has demonstrated the presence of tuberculous disease. In the very doubtful cases where we desire a positive answer, its results are apt to be so conflicting as to be unreliable. Besides, the writer has come across a case of prolonged conjunctivitis as a result of a violent reaction of the test, which, therefore, has not been without an element of danger.

One or many of the above aids may help the physician in deciding to form his diagnosis. But the basis of all decision must come from him, in the clinical signs he has observed by the bedside. If he cultivates the faculty of hearing and the power of observation, he will find in his stethoscope a ready and sure means of detecting early signs—early enough for all practical purposes—without having to resort to outside

[1] *Practitioner*, May, 1908.

[2] The *Lancet*, June 27, 1908, p. 1822.

evidence. The chief danger of relying solely on laboratory evidence is that the physician will become so dependent upon the pathologist for his diagnosis that he will lose from sheer disuse the faculties of seeing and hearing and those powers of insight and intuition which have been the chief guides to the general practitioner in times past in forming his diagnosis, and which cannot be replaced by any amount of research evidence from the laboratory.

One of the most important lessons one learns from sanatorium experience is that the tubercle bacillus does not attack the patient all at once, so that he becomes a consumptive in a few days or weeks; but it is like a thief who walks up and down the street for days before he selects his house, and having selected his booty, he waits for a favourable opportunity to enter the house, and even after entering it he hides himself for some time, if the inmates are about, before he commences his nefarious work. So months and years may elapse between the first attentions the bacillus pays to the patient and his firm grip on him. So subtle is this enemy, so quietly, like a thief in the night, does he carry on his deadly work, that I have known patients who never suspected anything wrong with their lungs till they reached the last stage.

Pretuberculous Stage.—The coming of the King Bacillus can be foretold by the advance guard, and the advance guard are the preliminary symptoms which the family physician has the advantage of watching, and which manifest themselves long before the lung is actually attacked.

The following are some of the commonest of the conditions that are found in patients that come for sanatorium treatment:

1. *Malformation of the Breathing Apparatus where the Lung Capacity is Poor and Expansion Deficient.*—More or less deformity of the chest, perhaps only a slight curvature of the spine, brought on by rickets, etc.

2. *Decayed and Decaying Teeth.*—The fact that more than 50 per cent. of the patients that entered our sanatorium had this trouble seems to point to a close relation between dental

caries and consumption. Diseased conditions of the mouth and teeth not only act as a breeding-ground for micro-organisms, but bring about catarrhal inflammation of the tonsils and the pharynx, which, if persistent, injure their epithelium, weaken their defensive power, and very likely help the spread of infection.

3. *Enlarged Glands of the Neck and Other Parts of the Body.*—As mentioned before, enlarged tonsils form another very important mode of carrying infection. In fact, bad air and insufficient food, septic mouth and decayed teeth, adenoid growths and naso-pharyngeal catarrh, tonsillar enlargements, and cervical and other glandular swellings, scrofulous diathesis and poor physical development, impaired nutrition and lowered vitality, all form a vicious circle which favours the entrance of tubercle and other germs in early childhood, when, if they do not develop and commence active mischief, they lie latent, and in after-years produce pulmonary tuberculosis of adults.

4. *Pleurisy.*—20 to 30 per cent. of patients in one institution give a history of pleurisy.

The relation between pleurisy and tuberculosis may be of two kinds:

(1) At this pretuberculous stage the patient may be attacked with simple pleurisy, which develops into tuberculosis in after-years from the weakness it leaves behind in the lung; or the pleurisy may be tubercular from the beginning, but lies latent, waiting for a favourable opportunity in years to come to become active, and assume its real character.

(2) The second kind of pleurisy attacks the patient between the second and third periods of the first stage, as we shall see presently. Of course, I do not include in these two the attacks of pleurisy that come and go during the course of the disease.

Consolidation Stage.—After varying time of this pretuberculous or preliminary stage, we come to the classical first stage, which can be divided into three periods—first, second, and third. Let us suppose that the enemy, which has been lodging either in the decayed teeth, or in the tonsils

or other enlarged glands, or in the pleura or some part of the lung, is ready to emerge from its fastnesses.

The first period corresponds to the time when the bacilli march onward to some definite field in the lung, and begin to pitch their tents or tubercles over the chosen camp.

The second period corresponds to the time when, still keeping to the same metaphor, the tents have been pitched, the discreet tubercles are formed, sentinels placed, and earthworks, in the form of lymphoid and giant cells, are erected in defence, within which the bacillus gets entrenched and hidden.

The third period corresponds to the time when man, the organism, alarmed at the presence of the enemy, sends large reinforcements or a blood-supply to the part to surround the tubercles, bringing about an area of congestion. The inflammatory products form all round and between the tubercles, till the affected part becomes more or less a mass of consolidation.

It may take months, and even years, before the third period is reached, and long or short intervals of quiescence may elapse between the periods.

What are the signs and symptoms to correspond with these periods?

FIRST PERIOD OF THE FIRST STAGE — (*a*) *Physical Signs and Symptoms.* — Taking the first period of the first stage, hæmoptysis, in some cases, betrays this period of infection. This early hæmoptysis, or, more strictly speaking, hyperæmia of the lung, is a good sign, for it shows that the organism has reacted very quickly, and at the very first approach of the enemy it has begun to give battle, and sent an extra supply of blood to the affected part. The patient with early hæmoptysis often gets well, for the blood seems to set free phagocytes, which directly, or through their antitoxins, destroy the enemy, and many a patient has been saved by this timely help of Nature. The hæmoptysis may be small or severe, and on examination you practically hear nothing. It is because the physician hears nothing that he is inclined to take no notice of the hæmorrhage, or believe that it came from the throat or some other part of the body.

(*b*) *Negative Symptoms.*—No dulness or crepitation, no cough or expectoration.

(*c*) The patient is subject to a vague feeling of malaise. He gets easily tired after exertion, does not sleep well, worries about work, is nervous and irritable. There is digestive disturbance, appetite bad. In women, in addition, there is languor and anæmia.

(*d*) A very important symptom of this period is the temperature, which goes up from ½° to 1° F. in the afternoon and evening, sometimes especially after exercise. The oral method often shows a lower temperature if taken immediately after the evening exercise. But, to be of diagnostic value, the temperature should be taken three times in the course of the evening. If the suspected patient goes for a walk from 4 to 5 in the evening, the temperature should be taken at 3.45; immediately after the walk, at 5.5; and after an hour's rest after the walk, at 6. Very often, while the afternoon temperature is about ½° F., the 6 o'clock temperature is 1° F. higher than normal. If there is not even a slight pyrexia in the afternoon, there will be evidence of it in the evening. Anyhow, the evening temperature, as compared with that of the morning, will show a distinct rise of ½° to 1° F., or more, above normal.

(*e*) *Pulse.*—There is marked frequency of pulse, with or without the rise of temperature, especially in highly nervous patients. Sometimes palpitation accompanies rapid pulse. In these cases it looks as if the commencing mischief in the lung had disturbed the nervous mechanism of the heart.

(*f*) *Physical Signs.*—Changes in the vesicular breathing. Instead of the respiration resembling the gentle sighing of the wind among the branches of the trees, the inspiration either becomes rough and cogwheel or weak and cogwheel, the cogwheel being especially marked about 1½ inches below the middle of the clavicle. The wavy breathing is caused by the deposit of tubercles bringing about an inflammatory thickening of the walls of the air-cells, and the inrush of air separating one by one the inflamed air-vesicles during

inspiration. The expiration may or may not be slightly prolonged.

SECOND PERIOD.—(*a*) Nervous symptoms continue. In fact, in a great many patients the nervous system is very early disturbed, as shown by the palpitation of the heart, the frequency of the pulse, etc.

(*b*) The temperature distinctly rises in the evening and after exertion. It may go up from 99° F. to 100° F., with a morning fall.

(*c*) The pulse-rate is quicker in the evening, and in neurotic patients both morning and evening. When it does go fast, it materially helps the diagnosis. I have seen patients with an evening rise of temperature and a normal pulse, and a normal temperature with a quick pulse.

(*d*) Impaired resonance on percussion, rough breathing, inclining to be harsh, and cogwheel. Expiration prolonged.

In the THIRD PERIOD the physical signs are those of consolidation. The dulness is marked; there is impaired movement over the affected area, harsh or bronchial breathing. You hear a fine crepitation, or dry crackling, or a bright click at the end of inspiration. The expiration is prolonged and harsh. The temperature goes up in the evening to 100° F. or more. The pulse is quicker, the patient feels flushed and hot in the evening, and is easily fatigued.

Between the second and third periods an attack of pleurisy may betray the presence of the disease. The evening rise from 99° to 100° F. persists longer than the ordinary pleurisy, thus revealing the tubercular nature of the disease.

The symptoms of the third period of the first stage, if they are acute—as marked dulness, a sharp rise of temperature, going up to from 100° to 102° F., and a quick pulse—may simulate those of pneumonia, affecting the base. In fact, they may not be distinguished from one another, as all apex pneumonia should be suspected of being tuberculous; so also in basal pneumonia, when, instead of resolution taking place about the second week, the temperature keeps high for several weeks, putting, of course, enteric fever out of the question. To prevent error, it should be borne in mind that

all breath-sounds have a tendency to become accentuated on the right side, and even in healthy persons, especially if they are inclined to be neurotic, jerky breathing may be heard all over the lung, which should not be confounded with cog-wheel or interrupted breathing heard over a definite localized area, as compared with the other parts of the same or the opposite lung. Also, when the breath-sounds are weak in the affected lung, they may be heard louder over the opposite side, which does not indicate any disease, but increased functional activity of the healthy lung by way of compensation.

Some cases do not advance further than this first stage. By this time the organism recovers sufficient strength to cut short any further encroachments of the enemy, or the patient's vague feeling of illness drives him to his family physician, who, perhaps without suspecting any commencing tubercular trouble, treats the dyspeptic and other symptoms, and recommends rest or change of air, all of which enable the organism to recuperate its flagging energies, so that it resists successfully, for the time at least, the invasion of the enemy. Thus many a case gets well at this early stage by the timely interference of Nature alone, or with the help of the physician.

Even now the enemy may not be completely scotched. Perhaps he is only lying low, waiting for a more favourable opportunity to renew the attack. Thus the different periods of the first stage may drag on for months, or even years, the intervals of the invasion of the bacillus being followed by successful attacks of the organism. But when it is finally overcome by the microbe enemy, the disease passes on to a later stage.

The second stage may likewise be divided into three periods. The first period corresponds to early softening. It is in the second period that the expectoration is well established, and sputum examination becomes possible, though we may be fortunate to get a little sputum in the first period; so one can understand that by the time the patient has reached this period he has gone a long way

downhill, and recovery is brought about at a sacrifice of time and energy.

To recapitulate: A history of hæmoptysis or pleurisy should put the physician on his guard; for a hæmorrhage that cannot be accounted for in any other way, and nearly all pleurisies, suggest early tuberculosis. Rough and cogwheel inspiration, or weak and wavy breathing, definite and localized, as compared with the other parts of the same lung or the opposite one; an evening rise of temperature, with or without quick pulse; a vague feeling of malaise and fatigue, with negative symptoms, suggest the first period of the first stage. Altered resonance; impaired movement, perhaps not well marked; rough breathing, inclined to be harsh and cogwheel; slightly prolonged expiration, with a definite evening rise, with or without nervous and gastric symptoms, point to the second period. While dulness and impaired movement, with harsh and wavy breathing and prolonged expiratory murmur, or wheezy or sibilant râles, with quick pulse, indicate the beginning of the third period. When this is established there is marked dulness and impaired movement, harsh breathing, inclined to be bronchial, fine crepitation or dry crackling râles, as thorns on fire, with a rise of evening temperature and quick pulse. When the dulness is not well marked, and the dry râles gradually merge into moist crepitation, and the patient is beginning to bring up a little phlegm, we can assume he is at the commencement of the softening stage. These periods may not be distinct, but may overlap one another; or the symptoms of the first and second periods may be present at the same time at different parts of the same or the opposite lung. And so also the symptoms of the third period of the first stage and the second period of the second stage may go together, as indicated by dry crackling râles at one part and moist râles at another part of the lung.

The great importance of early diagnosis lies in the fact that in many cases it means early treatment and early recovery. Of course there are cases where, in spite of all our efforts, the patient grows steadily worse, and goes

through the different periods and stages at lightning speed. It may be he has received an extra dose of infection, or the microbes have been of a virulent type. Excepting these cases, my experience is that an early diagnosis means speedy recovery, and that the longer the diagnosis is put off, the greater is the increase of the death-rate.

The time will soon come when the medical profession will be so trained to detect the early signs of the commencing tuberculous mischief by physical signs only that it will make use of the sanatorium not so much for curing or arresting consumption as for treating suspicious cases, and nipping the course of the disease in its early periods, and will thus prevent the terrible mortality this white plague causes at the present day.

CHAPTER IX

TEMPERATURE AND PULSE

THE longer one studies the temperature charts of tuberculous patients, the more one is puzzled to find out their true significance. The temperature of the body, like the mercury in the barometer, is never at a standstill, but is constantly rising and falling. The body temperature varies in different races and sexes, and at different ages; it varies also according to external surroundings, as climate, atmospheric conditions and temperature, temperament, operations of the mind over the body, etc. From 97° F. it may go up to 102° F., or even 103° F. in severe muscular exertion. Even in the same healthy person the temperature will not be two days alike at different parts of the day. But when we come to deal with conditions of disease, as in tuberculosis, all the above circumstances are intensified, making the range and variation of temperature still greater. And when the oral and rectal temperatures are compared, the confusion becomes still greater when the range and variation between them is considered in both health and disease, from day to day, in the same and different persons.

Oral versus Rectal Method.—In my experience, the registration of temperature by the oral, besides being more convenient than the rectal method, is for all practical purposes sufficiently accurate for everyday work in the sanatorium, provided the following precautions are taken:

1. The patient should rest in bed or on a chair for at least half an hour before the temperature is taken. In the morning the temperature is best taken before the patient rises.

2. Before the time for taking temperature, means should be taken to prevent the mouth being cooled by the cold air blowing over the patient's face, as by protecting the face with a shawl, or taking the temperature in a sheltered place, or in his own châlet or bedroom.

3. The patient should keep his lips firmly closed for a few minutes to warm his mouth, and then take his temperature with a half-minute clinical thermometer of a reliable maker for about five to seven minutes with the lips closed.

The cause of pyrexia in tuberculosis is supposed to be the infection of the organism by the tubercle bacilli. But this does not explain all cases. For there are as many non-febrile cases of tuberculosis as those attended with fever. The true explanation, it seems to me, which makes clear many obscure points in tuberculosis, is that **the rise of temperature is due to the increased activity of the organism itself.** It is because the measure of the increased activity of the organism is due to the activity of the pathogenic bacilli that one is led to believe that the temperature is due to the latter cause. In healthy individuals, as in runners, athletes, and mountain-climbers, after great muscular exertion the oral temperature may go up to 100°, 101°, or even to 102° F., which simply indicates increased physiological activity. And if inflammation—at least, the first stage of congestion—be considered a natural process, whereby Nature sends a large supply of blood to the part affected by microbes, the temperature which goes with increased hyperæmia should also be considered as Nature's effort to meet the increased demand made by the increased activity of the enemy. If the temperature does not go up, it means that either Nature finds the enemy is not active or is not worth troubling about, or that she finds the ordinary blood-supply to the affected part is quite sufficient to meet the enemy, or that her force is spent, and she has not the strength to fight.

The temperature may also go up from want of balance of the nervous system, whereby the mechanism that presides over temperature is easily disturbed, swinging up and down for the slightest cause, such as bad news, constipation,

exposure to the sun, and extra exertion, as playing croquet, etc. The rise of temperature in this case is only temporary, and is not continuous, as in the former case; and as the patient gets stronger, the nervous system gets better control of the temperature, and does not allow it to swing to and fro so easily.

The Behaviour of Temperature.—The temperature chart gives many important clues as to the progress of the disease or otherwise to the sanatorium physician. Generally speaking, the indication of temperature is more true in the early cases of pulmonary tuberculosis than when it reaches the second or third stages, or gets into a chronic condition. As observed in the last chapter, during the early periods of

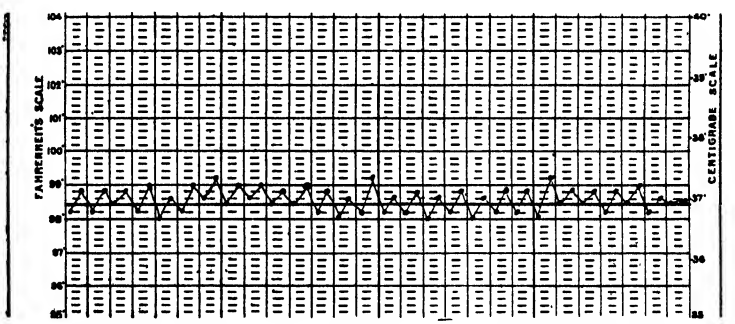


FIG. 1.—SHOWS THE RISE OF TEMPERATURE IN THE EARLY PERIODS OF THE FIRST STAGE.

commencing tuberculosis, the temperature goes up from 98·6° to 99·2° F. or more in the evening, and comes down to normal or subnormal in the morning. This rise, however small it may be, continued every day for a week, together with early physical signs, should be quite sufficient to justify a positive diagnosis, as in the following instances. The difference in the duration of the rise of temperature of sanatorium patients depends mostly upon when (the beginning, the middle, or the end of the first, second, or the third periods) they come under sanatorium treatment.

CASE 1.—A. O., a young lady, aged twenty-two; living at home. For nearly four months her appetite failed, and she felt sick in the morning; was easily fatigued on going for a

walk; could not give a cause why she felt unwell; was treated with tonics for the stomach. On examination, no physical signs could be found except rough and cogwheel breathing over the right apex, below the clavicle. The temperature was taken for a week; every evening it went up to 99° F., and came down to 97·8 to 98° F. in the morning; in two months dry râles appeared over the right apex. It was only six months after she was first seen that tubercle bacilli were demonstrated in the sputum. Patient got quite well.

CASE 2.—W. H., aged twenty-eight, a theological student from the North. The temperature went up from 99·6° to 99·8° F. every evening for four weeks. Wavy breathing over the left apex above and below the clavicle; fine crepitations over the same area; bronchial breathing over the left interspinous region. No sputum for six weeks, then he brought up a tiny bit of expectoration which contained tubercle bacilli. Quite recovered in five months. He is now an ordained minister.

CASE 3.—D. E., aged twenty, a lady teacher. Very anæmic; absolute dulness over the left base; no physical signs except harsh breathing and prolonged expiration over the left apex. The temperature went up in the afternoon and in the evening, and ranged from 98·6° to 99·2° F., and came down to normal after the fourth week. No physical signs could be detected over the left apex after the third month, and the dulness cleared over the base after the fifth month. No expectoration during her whole stay in the sanatorium.

CASE 4.—H. J., aged eighteen, a tall young man. An attack of hæmoptysis a few weeks before admission; temperature went up almost every evening from 98·6° to 99·4° F., once or twice to 99·8° F., and then came down to normal and kept there till he left; harsh and cogwheel breathing, and sibilant râles over both the apices, more marked on the left; weak breathing over the rest of the lungs, prolonged expiration; began to expectorate at the end of the fifth week, but only on four or five occasions during his six months' stay in the sanatorium; the sputum did not contain tubercle

bacilli. The pulse came down from 90 to 76 per minute in the evening at the end of six months, when he left quite well.

When the disease passes on from the first to the second and third stages, it gets complicated during its course with many other affections, such as sore throat, pharyngeal and bronchial catarrh, indigestion, constipation, diarrhœa, pleurisy, etc., any one of which may make the temperature go up, which, therefore, cannot be relied upon as an index to the extent of the disease. Even in the advanced stages, as long as the organism has plenty of resisting power, the battle will rage, the temperature will go up; and while by this time the pyogenic cocci have entered the field with the tubercle bacilli, Nature redoubles her efforts to fight the twin enemies, making the pyrexia still higher. As the disease progresses, the patient's nervous system becomes increasingly sensitive, the temperature easily loses its balance, and swings up for trivial causes, such as an attack of pain, a fit of coughing, a restless night, a little extra exertion, etc. Therefore the height of temperature in the advanced stages is not as significant as in the first stage, in the same way as a child's high fever is not so alarming as that of an adult. If by this time the enemy is not materially crippled or conquered, the disease gets into a chronic condition; Nature's resources are brought low, and she cannot give battle, and the temperature may not go up, or may even be subnormal. But when the mischief is not active, showing that the powers of the enemy are weakened, the fever abates, and the temperature becomes normal or subnormal.

In some cases, especially in children, the rise of temperature cannot be accounted for, as there is neither cough nor expectoration nor any physical signs. Some of these cases may be explained by the assumption that the mischief may be deep-seated in the lung or in the encapsuled bronchial glands; but all of them cannot bear such an explanation. In one patient the temperature used to go up to 103° F. for many days; there was no evidence of any physical signs of active mischief, or any pleuritic or pneumonic or any other complication. The patient ate well and felt well, and could not

understand why he was kept in bed. In other cases the temperature goes up at regular or irregular intervals to 100° and 101° F. or more, and gradually comes down to normal in a week or ten days; then it keeps normal for awhile, and goes up again. These seem to be cases of auto-infection—the mischief that has been lying latent is roused into activity, the battle rages, the temperature goes up, the enemy is repulsed or conquered, and there is an interval of quiescence when the temperature keeps normal.

Temperature and Exercise.—In the early stage after rest, the rectal temperature is usually 0·2° to 0·4° F. in the morning, and 0·4° to 1·0° F. in the evening, higher than the oral temperature; but after exercise the rectal may be 2° or even

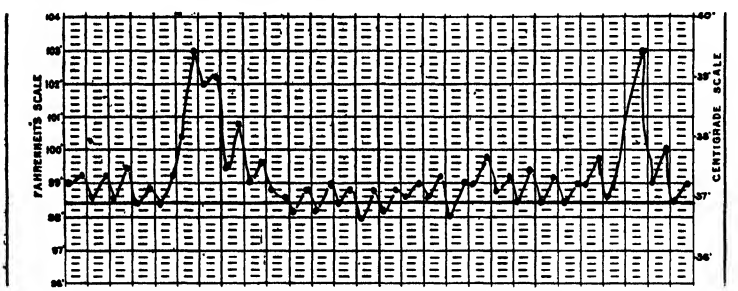


FIG. 2.—SHOWS THE TEMPERATURE GOING UP AT REGULAR INTERVALS.

3° higher than the oral temperature. If the temperature in a healthy person goes up to 3° or 4° higher than normal after undue muscular exertion—as running, racing, etc.—the high rectal temperature in patients after exercise cannot mean anything beyond an increased physiological activity. According to the oral method, the temperature usually falls after exercise, and recovers after an hour; and if the temperature after an hour's rest is still inclined to be higher than normal, then we can surmise that there is lung mischief, or the exercise has done harm, the harm being in proportion to the height of fever.

Pulse.—On the whole, the state of the pulse gives a truer indication of the progress of the disease or the health of the patient than the temperature. Therefore it is a tolerably

good guide to the physician in deciding the diagnosis or prognosis of a case. In some early cases the quickness of the pulse may be the only symptom to make the physician suspicious of commencing lung trouble. The frequency of the pulse is often more marked in town patients than in those who come from the country. A bad, sleepless night may make both the temperature and the pulse rate go up. When the pulse continues to be rapid, especially in the morning, the patient's condition is not right, even though the temperature and the physical signs appear to be normal. On the other hand, as the patient improves, the pulse-beat becomes less and less frequent, till the arrest of the disease is indicated, among other things, by the pulse becoming more or less normal.

CHAPTER X

THE PROGNOSIS OF PULMONARY TUBERCULOSIS

LIFE is mysterious. We do not know all the threads that go to make up life and its infinite resources and possibilities. Hence the physician sometimes finds himself humiliated when his prognosis has not exactly turned out as he expected. The prognosis of pulmonary tuberculosis mainly depends upon two factors. **Firstly, upon the strength of vital resistance** with which the organism meets the enemy. When the resistance is good, Nature cuts short the attack at its very commencement. This is why so many men and women get well without their knowledge, even in the advanced stages, as is evidenced by cicatrices of large foci found in the lungs at the post-mortem table. For the same reason (good resistance), if consumption gets implanted, the prospect of recovery is brighter in the first stage than in the second, in the second better than in the third. On the other hand, all those conditions associated with consumption that tend to drain the vitality of the patient make the prognosis bad—viz., living in unhealthy and overcrowded tenements and slums, poverty, alcohol, a hard and strenuous life, late and long hours, a life of constant fatigue and exertion and excitement, hereditary weakness, previous illness, etc. Patients from the towns who have been exposed to the temptations of town life do not recover so readily as those who come from the country and who have been living a quiet and simple life. Tall young men who have suddenly sprung up into maturity find great difficulty in overcoming

the disease. The prognosis is serious when consumption attacks young people at the time of adolescence (in girls from sixteen to nineteen and boys from seventeen to twenty), when Nature's increased activities at that period make a heavy demand upon their vital force. Young, anxious mothers with large families, mothers nursing their children, wives with family cares and responsibilities, are ill prepared to meet the disease; and when they come under the sanatorium treatment their progress is not so good as that of men who, as bread-winners, and feeling that a family is dependent upon them, try everything in their power to get well. But when the women recover, they continue to keep well much better than men, as they live, as a rule, a more steady and abstemious life. While care and anxiety retard, a calm and placid temperament helps the healing process of the lung. Provided there is resistance behind, acute forms of tuberculosis, such as those which begin with pneumonia, are more satisfactory, and heal more quickly than those which begin as non-febrile cases, and tend to take a chronic course. Clinically speaking, the prognosis very much depends upon the efficient working of the heart and the stomach. Without their aid, the physician and the patient are helpless.

Secondly, the prognosis is to be reckoned not so much upon the amount of vital resistance that is brought to bear upon the disease, **as upon the way that resistance is utilized** to aid recovery. A man of large fortune may, by his habits of extravagance, spend the whole of it, and become a bankrupt in a very short time. But a man of very limited income, if he uses it carefully and economically, may live comfortably all his days. The world is composed, not of a few great men, but many small people, and the majority of the patients that come under sanatorium treatment are common mortals, endowed with an ordinary amount of vitality. And if the prognosis depends upon the amount of vital resistance which may be inherited or acquired, it still more depends upon how that limited resistance, possessed by so many, is utilized to restore health. Therefore I say that to a great extent prognosis depends upon the patient's

own individual efforts. If he husbands his resources, stops the leakages, and uses what he has to a wise purpose, he will not only hold his own and recover, but will even overcome his disabilities brought on by heredity, bad environment, etc., and turn them to his advantage and blessing. One of the secrets of the sanatorium treatment is that it helps the patient to husband his strength, and utilize every particle of his vital force to the best purpose.

But this second factor in prognosis should be qualified by one condition—*i.e.*, **the patient's resistance should not be lower than the minimum amount.** Just as it is impossible for a workman to live below a minimum wage, and all his frugality and economy will not compensate for the deficiency, so all the patient's efforts and determination to get well, and all his endeavour to economize his energy, will be of no avail if his resisting power is below what is necessary to fight the disease and conquer. And this necessary amount can only be ascertained by the clinical progress of the disease. If he does not progress in spite of the open-air treatment and right living, either the enemy is too strong, or the vital energy is below the margin necessary for Nature to make use of in her fight with the enemy.

General Considerations. — The disease stays its hand during pregnancy, and afterwards it takes a rapid course. In my experience, the left side is more commonly affected than the right. The right side seems to get well quicker than the left. Pleurisy, affecting the left axillary region, is very persistent. Any pleuritic or pneumonic complication, or any extension of the disease at the base, tends to recover more quickly than at any other part. Perhaps the blood tends to gravitate towards the base when the patient spends a great part of his time in the prone position, leading to a congested state of the lung which makes for healing. In fact, the prognosis of the congested type of pulmonary tuberculosis is more hopeful than the chronic and anæmic kind. Young children between seven and fourteen do well; all the cases that came into the sanatorium at this age made a good recovery. As the patient wards off the disease every

year after twenty, the prognosis becomes brighter. The open-air treatment is not contra-indicated in cases associated with bronchial catarrh, which, however, hinders the patient's progress. The chief danger of incessant cough lies in the fact that the phlegm is liable to be sucked into fresh parts of the lung, which may thus become centres of infection.

Pulse.—If the pulse-beats are more or less normal, the prognosis is favourable, even if the physical signs are obscure or the disease is suspected to be extensive. A wiry, soft, and rapid pulse, especially in the morning, is a bad sign—the more frequent the pulse, the graver the prognosis. But as the pulse comes down in frequency during treatment, the prognosis becomes more and more hopeful. Hence the pulse is a surer gauge of the patient's condition and progress than the temperature.

Temperature.—We cannot give a decided prognosis from the temperature alone. We cannot say that the more normal the temperature the better the prognosis, unless other signs equally favourable go with it, such as pulse, etc. Some of the most intractable cases are those of a chronic type, where the patient's poor staying power goes with a normal or subnormal temperature and signs of extensive crepitation. It will be nearer the truth to say that a temperature with physical signs is more hopeful than no temperature with the same physical signs; for a temperature indicates that the organism has at least some resistance with which to fight the enemy.

Tubercle Bacilli.—The presence or absence of tubercle bacilli in the sputum does not help us to give a decided prognosis one way or the other. I have seen tubercle bacilli present in strong, healthy patients who had a normal temperature and very few physical signs, and who ate well and felt well. On the other hand, patients with extensive mischief in the lungs sometimes brought up no bacilli. Their presence in the lung does not indicate to what extent they are active or passive. Some of the grave signs and symptoms associated with pulmonary tuberculosis are due to the secondary infection of the lung by pyogenic cocci; and the

arrest of disease is more due to the absence of these various forms of cocci in the lung than to the absence of tubercle bacilli.

With all his calculations, the physician finds himself sometimes beaten in his prognosis when some of his most promising cases go wrong, while others, of whom he had little or no expectation, have crowned his treatment with success.

PART II

'Air, air, fresh life-blood, thin and searching air,
The clear, dear breath of God that loveth us.'

CHAPTER I

THE PRINCIPLES OF THE OPEN-AIR TREATMENT

'All things which are done according to Nature are to be accounted for good.'—CICERO.

'Nature is only conquered by obeying her.'—BACON.

THE open-air treatment for consumption has been carried on in England for about ten or eleven years. During this short time—thanks to its pioneers, who have mostly been medical men working in connection with private sanatoria—public interest, from the King downwards, has been roused in the movement. Various open-air sanatoria, mostly municipal and philanthropic, have been built all over the country, and others are in course of construction. It was only about a few years ago that consumption was regarded in England as an incurable disease, and well-to-do patients were sent away to some warm climate or for a sea-voyage; or, if this was not possible, they were kept in their own rooms by the side of a blazing fire, and left to follow their own free will. Now a great revolution has taken place in our ideas concerning both the nature and the cure of the disease.

Open-air Treatment from Ancient Times.—The knowledge of the value of fresh air in health and disease has been recognized and understood from olden times. It is as old as the ancient Indians and Greeks, who lived the open-air life, and whose public gatherings and places of amusement were all in the open air. The ancient Yogis in India believed that consumption and other diseases were due to lowered

vitality, brought about by breathing an insufficient amount of air, and therefore they paid great attention to correct habits of breathing. They also believed that breath was life, and that fresh atmospheric air, in its freest state, was charged with a universal principle of life, or vital force, called *prana*, which is allied to the breath of life mentioned by the Hebrew writer of Genesis ('And the Lord God . . . breathed into his nostrils the breath of life,' Gen. ii. 7), and which, when stored in the body, radiates strength and vitality, and develops latent faculties and psychic powers. So great was their faith in fresh air in health and disease that they gave minute practical instructions on various breathing exercises, and founded whole schools of philosophy on the science of breath. We read of Hippocrates recommending rides on horseback, and of Celsus advising sea-voyages. Coming nearer to our own times, we find Laennec advocating living by the sea in cases of phthisis. All these must have had an idea of the benefit of the open air. In 1747, a Scotch physician is said to have written to his friends that the most important factor in the treatment of consumption was fresh air and diet. In a treatise on 'Domestic Medicine,' Dr. William Buchan, in 1783, wrote that 'on the first appearance of a consumption, if the patient live in a large town or any place where the air is confined, he ought immediately to quit it, and to take choice of a situation in the country, where the air is pure and free.'

In 1840, George Bodington, of Sutton Coldfield, England, read an essay on 'The Cure of Pulmonary Consumption,' and tried to convince his medical brethren of the curability of the disease, and the importance of fresh air, day and night, in its treatment. He may be rightly called the father of the open-air movement. Other prophets of fresh air arose in turn, chief among whom may be mentioned the names of Dr. McCormac, of Belfast, and Sir Benjamin Ward Richardson, of London, who shared the same fate of ridicule and contempt of their brethren for their opinions and enthusiasm.

In 1859, Hermann Brehmer, in spite of great opposition, gave practical expression to his open-air view by building

the first sanatorium for fresh-air treatment in Gœrbersdorf, Silesia, and he thus became the father of the sanatorium treatment of consumption. He was followed, among others, by Dettweiler, of Falkenstein, and Otto Walther, of Nordrach, who popularized and worked out the details of the treatment. Their success spread all over Europe, and at last England caught their inspiration.

So that whereas, about ten years ago, when I opened a sanatorium for pulmonary tuberculosis, there were only three or four similar establishments in England, now there are about sixty-three public and thirty private institutions where the open-air treatment is more or less being carried out. True, these are not enough to supply the present need. There are in the United Kingdom about 160,000 persons annually suffering from consumption, about 70 per cent. of whom belong to the working classes. In 1904 more than 57,000 deaths in England and Wales were due to tuberculosis, of which consumption claimed 41,000 victims. During the years 1904 to 1906 the death-rate from pulmonary tuberculosis has been about 12 per 10,000—*i.e.*, rather more than one person out of every thousand living dies annually of this disease.

Open-air Treatment and Consumption.—The writer's experience leads him to say that, of all the varied forms of treatment that have been advocated for consumption from time to time, the open-air treatment gives the best and most satisfactory results. The treatment by tuberculin and other injections, or by the opsonic method alone, are on their trial, and cannot be considered either reliable or satisfactory. The advantages of the open-air treatment are:

1. It is a natural treatment. The secret of its widespread interest in Europe is due to the discovery—if discovery it may be called—that fresh air, hitherto regarded as an enemy to be shut out and barred, is really a friend, and one of Nature's best gifts to man, without which life slowly fades and disease lengthens its stay; and that man, by building towns and manufacturing dirt and disease, is undoing Nature's work, and that to put himself right again he must go back to

Nature, and lead an open-air life in the green fields and meadows, and breathe the sweet fresh air.

2. It is based on a sound, rational foundation. It is Nature's mode of cure. She sends out her sick children into the fresh air and sunshine. When a horse is ill, we turn him out into the fields; when a native in Oriental countries becomes indisposed, he quietly leaves his relatives and friends, and goes over the hills and mountains, as the saying is, and returns when Nature has nursed him back to health. Even to the present day natives in many parts of Africa and India worship the sun as the source of all life and energy, and bring out their sick relatives and old people into the open air and sunshine. Fresh air and sunshine are therefore Nature's physicians, and when the Occident now turns its attention to the treatment of consumption by fresh air, it is merely adopting Nature's methods and ways, which it has long forgotten, and from which it has wandered these many years, much to the detriment of the physical and moral well-being of its children.

3. The open-air treatment is more satisfactory, as it creates a natural immunity. True, Nature takes a long time to repair the broken edifice, but she lays her foundations deeply, and builds surely, though slowly. Hence the immunity she creates is more lasting and enduring than what man creates by artificial methods.

Sanatorium Treatment and Pulmonary Tuberculosis.— The best results of the open-air treatment are obtained in a well-conducted sanatorium, where all the means and appliances are available to carry out the treatment to the fullest possible extent. There has been a controversy as to how far the success that was expected by the founders of the sanatorium movement has been realized, and a doubt expressed in some quarters as to the efficacy of the open-air movement. Laymen, encouraged by the early enthusiasts of the movement, expected that everyone entering the portals of the sanatorium would be cured in a very short time. And even medical men, without giving a due consideration to the question, were led away by exaggerated

reports, and proclaimed in private and in public that a few weeks' stay in an open-air establishment would be sufficient to cure a consumptive patient. The inevitable consequence was that the results fell short of public expectation, and discredit most unjustly fell on the whole movement. The truth is that in many of the reputed cases of failure it was not the sanatorium that was at fault, but the conditions that interfered with the treatment and made it impossible. We hope to discuss this question in the next chapter ; meanwhile, I should like to say that every method of treatment has its limitations, and sanatorium treatment is no exception. It can no more cure all cases of consumption than a cascara pill can cure every case of constipation. But I venture to say, without fear of contradiction, that in very few methods of treatment have there been such marvellous results in the past, and such abundant cause for hope of success in the future, as in the open-air treatment for consumption.

In what ways has it been a success ?

1. The sanatorium treatment has taught the patient to husband his resources and to economize his resisting power by well-directed effort, and has helped him to increase it prudently, like a thrifty housewife, and to concentrate all the energy thus obtained to overthrow the disease

2. The results of the treatment have been very encouraging (see Chapter III.). Seeing is believing. If only a sceptic could have seen with me some of the seemingly hopeless cases on admission to the sanatorium, and again seen the marvellous change for good that came over them six months after they had been treated in the sanatorium, he would become converted, and be as enthusiastic as I am in the conviction that no other remedy known at present has been so successful in saving so many lives from a sure and certain death. Where it has not arrested the disease, it has helped to improve the health of the patients and prolong their lives, making their condition more bearable and comfortable.

3. The value of the fresh-air movement is not to be gauged merely by the number of lives it has saved or prolonged. Its scope extends further. It is wonderful that within a few

years of its existence it has been the means of revolutionizing the ideas of society and nation with regard to the value of fresh air and health. It has made people think, and has made them resort to simpler and more natural modes of living. It has given an impetus to individual, social, municipal and national reforms that make for the health and well-being of the citizen and nation.

4. The open-air movement has given birth to new ideas and enlarged the outlook of life. It has made the nation see the folly of crowding into towns and cities, and of shutting out God's best gifts to man as if they were poison. When patients have been educated in a sanatorium as to the right modes of living, and have returned home, they in turn become teachers to their own household, showing them the benefits of living in the country, and of sleeping with open windows. Thus each patient, as with ruddy cheeks and returned health he faces a circle of friends, becomes an apostle of fresh air and sunshine, and silently helps to bring about a revolution which aims at the happiness of home and the community.

5. The open-air movement in no small way inspired the idea of garden cities and recreation-grounds and parks, which are everywhere increasing in number. It has enabled the municipalities and corporations to prohibit spitting in public conveyances. It has strengthened the hands of the pioneers of better sanitation and hygiene in their thankless task. It has brought the builder into line with the new movement, so that he may build houses not only artistically, but with a view to better ventilation and admittance of more sunshine. It has encouraged the municipal reformers to abolish slums and rookeries, and to beautify their towns and cities with gardens and open spaces.

6. When the people of this country begin to realize fully that fresh air is somehow or other connected with the healthy life and the building up of a more perfect humanity, they will go further, and extend their reforms from the cure of one disease to the prevention of all disease. They will set to work to remove such evil factors as keen competition,

overcrowding, poverty, drink, etc., which form a vicious circle with tuberculosis, and, in fact, with all disease. Thus the open-air movement has a boundless horizon, a wide outlook in the future. Instead of being considered a failure, it will prove itself to be one of the most important ideas of the age, bringing untold blessings in its train. Like a stone dropped into a still lake, it will set in motion influences and reforms which will extend with ever-widening circles, transforming the habits of life and the character of man and society, so contributing to the physical and moral efficiency of the nation.

CHAPTER II

THE PRINCIPLES AND PRACTICE OF SANATORIUM TREATMENT

'Now I see the secret of the making of the best persons:
It is to grow in the open air, and to eat and sleep with the Earth.'
WALT WHITMAN.

THE sanatorium treatment is based on sound hygienic and scientific experience. It is no quack remedy that is popular to-day and passes away to-morrow, for it is founded upon the rational principle that the open-air life is the most natural and hygienic life, and one in which the body fulfils its highest physiological perfection and development.

This chapter will be mainly devoted to the description of the practical side of sanatorium life as carried out on the Mendip Hills. The objects of the sanatorium treatment are, briefly: (1) To carry out in daily practice the lessons of the open air; (2) to follow closely Nature's footsteps in the restoration of health; (3) to economize all the resources of the patient to the fullest possible extent; (4) to reduce to a system the various elements of fresh air, food, exercise, and rest, so that they may be administered by the physician according to the requirements of each patient.

Preliminaries to Treatment.—Patients are advised to wear light, warm, and loose clothing, and to avoid clothes made of black, red, or yellow material—especially anything in the nature of black—as they prevent the sun's rays from reaching the skin and acting beneficially on the system. They should wear light tweeds, and flannels in light grey, fawn, or light green. In the summer, cream or white

material may be preferred. The gentlemen are recommended to shave off moustache and beard, and to wear flannel shirts and collars to keep the neck free. The body resents anything tight round the neck or the chest, so all tight-fitting dresses should be banned. It is better for the ladies to wear short skirts (about six inches from the ground), to allow free movement of the legs while walking, and short rational stays or ribbon-stays—if stays are to be worn at all—so that the expansion of the lung may not be impeded. Centuries of wrong clothing have brought about an unnatural habit of breathing which has contributed in no small way to the predisposition of disease, and dress reform should form part of education if prevention of disease is to be the ultimate aim of civilization.

The following is the daily programme of the patients in the sanatorium:

7.30.—Patients take temperature while in bed.
7.55.—Physician goes round.
9.—Breakfast.
10.—Breathing and singing exercises.
10.15.—Morning walk.
11.30 to 12.30.—Manual exercises, as gardening, carpentering, etc.
12.30 to 1.30.—Silence hour.
1.30—Dinner.
2.15 to 3.15—Rest after dinner.
3.15 to 3.45.—Formaldehyde inhalation.
3.45 to 4.—Breathing and singing exercises.
4 to 6.—Tea and evening walk.
6 to 7.—Silence hour.
7.—Supper.
7.45 to 9.—Recreation. Patients' own time.
9.—Bedtime.
9.30.—Lights put out.

From this it will be seen that an ordinary patient is occupied with the daily routine during the whole day, so that time does not hang heavily on his hands. This

programme is slightly altered in the summer, and also in individual cases, according to temperature, etc.

(*a*) Fresh Air.

Of all the agents used in the sanatorium treatment, fresh air comes first and foremost. The whole of the treatment is based upon it. All the efforts of the sanatorium régime are so directed as to enable the patient to have a constant supply of fresh air day and night. The more thoroughly the patient's life is spent out of doors, the more satisfactory is the result. Who can rightly estimate the importance of this, one of Nature's most beneficent gifts to man? If the Yogi philosophers of India are right, then, besides its chemical constituents, the atmospheric air contains a vital universal principle called *prana*, through which life manifests itself, and life comes and life goes—and the fresher the air, the more it is charged with *prana*. This may explain why fresh air is so essential to all life, and without it life ceases to exist even for a few moments.

The effects of fresh air are both physical and psychic. It lessens irritability, and calms the nervous system. It flushes the body with abundance of oxygen, stimulates various physiological activities, increases nutrition, and braces up the nervous system. The beneficial effects of fresh air are enhanced by the action of sunlight, which purifies the atmosphere by its actinic rays, and both have a stimulating and vitalizing influence upon the organism. Under the influence of fresh air the patient loses his irritability and nervousness; it increases the appetite, lessens fever, and promotes sleep. In fact, it is food, medicine, and more, all combined. The patient's life is so arranged in the sanatorium that he spends his time in the open air. In the summer he practically lives out of doors day and night, merely using his châlet for dressing and his rest and exercises; his meals and amusements, and even the Sunday services, are all carried out in the open air. In the winter he spends a great part of the day on the veranda, and even sleeps out there if the

weather is favourable. And open-air life is made as pleasant as possible by croquet and picnics, tea-parties and walking excursions, which are organized from time to time. The senior patients spend part of their time in open-air camps, and are allowed to go out shooting. Thus all kinds of inducements are held out to make the open-air treatment a reality. The châlets are so built as to allow the fresh air to flush through every part of the room. They are all situated on the ground-floor, and are built two by two, so that each of them is open on three sides. A common corridor runs along the back of the châlets, facing north; and on the south side there are two large French windows, extending from the floor to the ceiling, and leading to a veranda in front, separate for each châlet, and on the same level with the bedroom, so that the bed can be wheeled right out.

(*b*) Rest.

Rest further enhances the effects of fresh air. It stops all unnecessary leakage and expenditure, and enables the nervous system to get back a healthy control over nutrition and circulation. The modern age has lost the secret of restfulness and has learnt the evil of restlessness. But Nature rests everywhere. In the long dark winter Nature rests from her active labours, and at the same time is passively engaged in storing materials for the wants of summer. When the curtains of the night are drawn across the world, man and all living things seek their rest in sleep and quiet, to recuperate the jaded energies spent in the day's activities. And in conditions of disease, when fever racks the forehead, and the hot blood pulsates through the veins, the child seeks its mother's arms, and the patient his repose in bed. Rest and exercise are twin sisters that make up the sum total of life. Only rest is the elder sister that closes the weary eyes and soothes life's fret and fever; and exercise is like the laughing stream, or the skipping deer, that gathers strength as it wanders from place to place. Here, in rest, in the open air, the physical and psychic elements of man come

very near each other. As the patient rests and communes with Nature, the calm surroundings, the serene landscape, the quiet evening, hush him into silence, and breathe a spirit of restfulness and peace in his inmost being. In this age of bustle and excitement, when restlessness is bred in the very bone both by heredity and environment, it is becoming more and more necessary that the physician should enjoin rest upon the patient to bring about the healing of the lung.

When a patient first comes into the sanatorium, he is either put to bed for a few days or ordered to rest in the open air during a great part of the day. The higher the temperature, the more he rests. And rest is enjoined during the whole of his sojourn in the sanatorium. The junior patients rest more than the seniors, and go to bed earlier. As childhood slumbers early and long, so the patients require longer hours of rest in sleep. The temperature roughly guides as to the amount of rest to be prescribed to each patient. In some cases, where the fever is persistent, absolute rest in bed helps to bring the temperature down. The following is posted as a guide to the patients:

Morning Temperature.

If above 98·4° F. and below 99° F., cut short walk to ten minutes.

If 99° F. or below 99·6° F., rest on lounge-chair.

If 99·6° F. and above, remain in bed.

Evening Temperature.

From 98·6° F. to 99·4° F., cut short walk to ten minutes.

If above 99·4° F. to 100° F., no walk; rest in chair.

If 100° F., or above, to bed.

N.B.—The physician may find it necessary to modify the above guide to meet each patient's requirements.

(*c*) Exercise.

In this sanatorium, besides the ordinary routine, we lay stress on three points of treatment: (1) Various kinds of

exercises; (2) formaldehyde; and (3) electric treatment. The two latter will be considered in separate chapters.

Exercises form a very important part of our daily régime. The writer has given very careful attention to this part of the treatment for many years, and had developed them into a system long before others brought the matter before the profession. The expression of opinion in German sanatoria in regard to the value of rest and exercise has divided them into two schools. In one rest, and in another exercise, is given more prominence in the treatment. The truth lies between the two. Consumptive patients require both. Nowhere is the skill and ability of the sanatorium physician tested so keenly as in the manner in which he regulates the amount of rest and exercise requisite to each patient. It can be laid down as a general rule that the patient should rest when he has a temperature—the higher the fever, the more absolute the rest—and that when the temperature comes down to normal, exercise should be begun. But this rule needs some qualifications, and it is only by long experience that the physician will be able to know how to deal with each patient. In some cases, where there is a great deal of fatigue and exhaustion, rest should be prescribed even when the temperature is normal. In other cases a little exercise acts beneficially, even where the temperature contra-indicates it.

The patient's life in the sanatorium can be roughly divided into three periods. In the first he takes more rest than exercise. The temperature, if he has any, is brought down by rest in bed, and after it has reached more or less normal, exercise is begun slowly, and increased gradually as his strength and temperature allow it. In the second period, while he has rest, the hours of exercise are increased: he takes longer walks, ranging from four to eight miles a day; besides, he goes through the breathing and singing exercises. In the third period, while rest is still enjoined, the exercise becomes more varied and arduous: he is put to gardening, carpentering, making paths in the woods, etc., while he does full justice to all the breathing and singing exercises.

The exercises carried out in our sanatorium come under six headings: (1) Walking exercises; (2) breathing exercises; (3) singing exercises; (4) reading exercises; (5) manual exercises; (6) tramping, etc.

1. **Walking Exercises.**—When the patient's temperature is normal, or approaches it if it has been high, he commences to take walks, beginning from half a mile to eight or nine miles a day. If the temperature is normal in the morning and rises in the evening, he is allowed a little walk in the morning, and rest during the remaining part of the day. There is no hard-and-fast rule applied to all patients alike. The physician daily supervises the walk of every patient. If the patient has been in the sanatorium for some months, and is kept in bed more or less all the time, because the fever has been continuous or inclined to go up in the evening, then it becomes a question of choosing one of two evils: absolute rest in bed with the patient getting dull and tired of monotony, his muscles flabby, the digestion poor, and the nights restless; or relaxing the general rule, and varying a part of his programme in spite of his fever. The latter seems the less of the two evils, as we have found from experience that some of these patients are better for sitting up in bed, or for a little walk in the morning, or a small drive, etc.—any change like this tending to break the monotony and to add a new interest to life, and help appetite and digestion. But as the temperature becomes normal and the patient improves, he is slowly and gradually promoted till he does the full time of about three hours of walk a day—an hour and a quarter in the morning, the same in the evening, and half an hour before breakfast and after supper—when he covers about eight to nine miles during that time.

2. The **Breathing Exercises** are performed when the patient's temperature is normal, and active disease is more or less quiescent. These respiratory exercises, so far as the sanatorium is concerned, have for their object not so much the development of the muscles of the body as the development of correct breathing and expansion of the chest; therefore ordinary calisthenics, Swedish drill, and athletic

exercises with dumb-bell or Indian clubs, etc., as practised in schools or in gymnasiums, have no place in our sanatorium. Ours are more medical exercises, carried out under the supervision of the physician, according to the condition of the patient, who is forbidden to take part in any of them if the temperature is high or his health is in any way considered unsatisfactory. While our main object is to improve the expansion of the lungs, the whole body derives benefit by increased oxidation and circulation, and improved well-being.

Preliminaries.—The patient, either in the open air or in front of the open window, stands erect, his legs and thighs pressed together and rigid, the hands down, with the palms against the legs, the shoulders thrown back, the chin slightly up, and the lips closed.

No. 1 *Exercise.*—(*a*) The patient, as he slowly extends the arms to a horizontal position, takes a deep inspiration, retains the breath at this position for two or three seconds, and brings the arms down to the sides, expiring the air at the same time through the nostrils. The breathing-in should correspond to the extension of the arms, and breathing-out when the arms are brought to the sides. This is repeated six times, with an interval of three or four seconds between each repetition.

(*b*) The same as above, but the heels are raised with the extension of the arms and inspiration, and are brought down during expiration.

No. 2 *Exercise.*—(*a*) With the preliminaries of the first exercise, the arms are raised over the head during inspiration till the palms of the hands meet, the patient expanding the chest and taking in deep breath all the time; and after a second or two, the palms turned outwards, the arms are slowly brought down to the sides during expiration. This is repeated six times.

(*b*) Here, while the arms are coming down and the patient is slowly exhaling, he bends forward, presses the elbows to the sides, and squeezes the sides of the chest and the diaphragm against the lungs. This is repeated six times.

No. 3 *Exercise.*—(*a*) The head erect, the heels together, the arms flexed, the palms of the hands pressed to the sides, the fingers pointing inwards, the arms are swung forwards as far as they will go, as in the act of swimming, the patient breathing deeply through the nose, and then the arms are brought to the sides during expiration.

(*b*) A bigger sweep of movement is given by bringing one of the legs forward, and while bending the body forwards the arms are stretched, as in the act of swimming, and the exercise finished as in the first part of the exercise. This is repeated three times. Then the other leg is brought forward, and the exercise repeated another three times.

No. 4 *Exercise.*—Yogi breathing. This is one of the commonest exercises practised by the ancient Yogis, who believed that correct breathing tended to prevent disease and lengthen life. Although this exercise is divided into three parts, bringing into play first the lower part of the lung and the diaphragm, then the middle, then the upper part of the lung, it is one long, continuous breathing, which expands the whole, from the bottom to the top of the chest cavity. The patient, sitting or standing erect, breathes through the nose, and, without any jerk, inhales steadily, first filling the lower part of the lung, pushing forward the front walls of the abdomen; then he fills the middle part, pushing out the lower ribs; then the upper part of the lung, lifting the chest and upper ribs; and at the end of inhalation he throws the head back, elevates the shoulders, and raises the collar-bones, and at the same time draws in the abdomen a little, which the Yogis believe helps to fill the apices. Then the patient retains the breath for a few seconds, and exhales slowly from above downwards. When all the air is expired, he relaxes the chest and abdomen, to begin the whole exercise over again. This exercise can be practised during the silence hour, or any other part of the day.

The first three exercises take about ten to fifteen minutes twice a day. When a patient's temperature is satisfactory, he begins with the first, and gradually goes on to the second, and then to the third exercise. If he comes under treat-

PLATE III.

NO. 2. NO. 1. NO. 3.

PHYSICAL EXERCISES.

To face page 96.

ment in the early stage, he is rapidly promoted to all of them.

We find that these various exercises, properly performed, while they teach the patient the art of correct breathing, expand the chest, develop the muscles of the trunk, dilate the air-vesicles and increase the lung capacity, and, by the simultaneous contraction of antagonistic muscles, produce symmetry of body, correcting any small deformity or abnormality, so prevalent among consumptive patients. Physiologically, they quicken the respiratory functions, accelerate the flow of blood, stimulate the hepatic secretion, regulate a healthy metabolism, and improve the general health.

3. **Singing Exercises.**—These also form an important part of the respiratory exercises. They maintain a better expansion of the chest and a freer passage of air to remote parts of the lung, such as the apices, and determine a more efficient supply of blood to these parts, and thus indirectly improve the local and general health.

(*a*) The patients sing 'ah' to the first six notes up the scale, beginning from the middle *c*, and then down, taking as long a breath as possible with every note.

(*b*) Then they go on to sing 'ah' to the first four notes up the scale at one breath, and down the scale at another breath. The four are gradually increased to six and then to eight notes up the scale at one breath, and down at another breath.

(*c*) After this, the four notes of the chimes are sung at one breath, then eight notes at one breath.

(*d*) Then they learn to sing simple musical pieces on 'ah,' the whole of the singing taking about ten to twelve minutes, morning and evening.

The breathing exercises, if correctly performed, not only improve the thoracic movement of the chest, but also increase the diaphragmatic breathing.

I quite agree with Dr. Halls Dally[1] that the measurement of the chest expansion is no index of thoracic respiratory capacity or pulmonary mobility. The movement of the

[1] *British Medical Journal*, August 29, 1908.

pulmonary apices is more influenced and freer access of air is better secured by the costal or diaphragmatic than the thoracic breathing. Too much stress has been laid hitherto on the chest expansion, and very little upon the up-and-down movement of the lung. The diaphragm plays a very important part in respiration, and its limited movement very often indicates early disease of the lung. Hence it is essential that the diaphragmatic breathing should be specially developed in pulmonary tuberculosis as soon as the disease is in a quiescent state. As the patient improves, the free movement of the diaphragm is more or less restored by the breathing exercises.

4. **Reading Exercises.**—Besides singing, reading aloud in the open before a group of patients is another pleasant form of exercise which beguiles away half an hour of sanatorium life. A few patients select a piece of prose or poetry; then each takes his turn in standing before the audience, and, with the chest raised and shoulders down, reads slowly and distinctly the selected piece for about five to ten minutes.

5. **Manual Exercises.**—When the patient is able to walk about four to five miles a day, and the temperature is satisfactory, he is allowed to do some manual work for about twenty minutes, which is increased to forty minutes, and then to an hour a day. There are three grades of work:

First Grade.—Weeding in the garden, hoeing, raking, and gathering leaves, edging grass, planting, pruning, etc.

Second Grade.—Chopping logs, making paths in the woods, spade-work, digging broken ground, etc.

Third Grade. — Sawing, carpentering, painting, digging unbroken ground, wheelbarrow work, etc.

Ever since manual labour was introduced in this sanatorium as part of the treatment a decided improvement has been noticeable. During an experience of more than five years we have had no untoward result except in two instances, when the temperature rose after the exercise and continued for some days after, which showed that the patients had over-exerted themselves. Of course, in a private sanatorium

PLATE IV.

PATIENTS' WORKSHOP FOR SAWING, CARPENTERING, ETC.

To face page 98.

it is not possible to enforce the same amount of manual work as in a public one among patients who are not used to such labour. Besides, it is not necessary, for our senior patients do four and a half hours' exercise every day, which I consider quite sufficient to obtain the full physiological effect.

The temperature, as in the case of rest, is a rough guide to the physician as to the amount of exercise he should prescribe. I do not think that a rise of temperature to 99° F., or even to 99·4° F., is a contra-indication to work. On the other hand, I am of opinion that a small rise is often a sign of a healthy reaction, and an indication that Nature is working

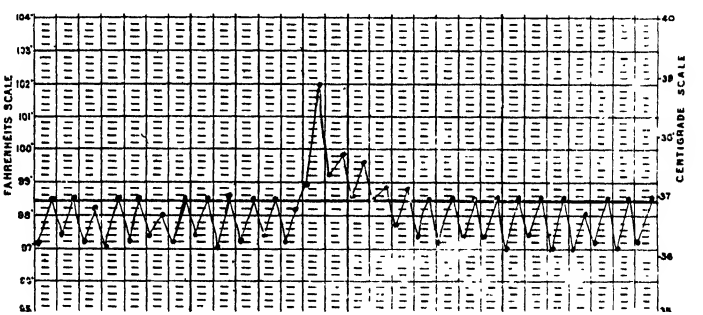


FIG. 3.—SHOWS THE EFFECT OF MANUAL EXERCISE ON THE TEMPERATURE OF A SENIOR PATIENT. PAGE 98.

to produce a natural auto-inoculation, by which she seeks to bring about an arrest of the disease.

6. **Tramping, etc.**—The great point about exercise is that it should be varied to relieve monotony. While it is true that the different exercises should be regulated according to the condition and necessity of each patient, no hard and rigid rule should be made in carrying them out. Too much regulation would endanger the whole treatment. The iron hand of discipline should be covered by the velvet glove of variety and relaxation. While keeping to essentials, the exercise should be varied and made as pleasant and agreeable as possible, and a patient's willingness and co-operation encouraged. Hence the introduction of the sixth division

among the exercises. Some senior patients are allowed to shoot. The patient, with a gun in his hand, tramps many miles in search of game. The writer is convinced that long, steady walking, without feeling fatigue — specially walking with an object in view—is one of the most healthy exercises for a consumptive patient: it stimulates all his bodily functions, and he comes back in a healthy glow. For this reason, walking excursions are undertaken, with the supervision of the physician, and places of interest visited. Judicious tramping is one of the important means in the hands of the physician for the restoration of a diseased lung. At other times open-air tea-parties are formed, when reading aloud a humorous piece by one of the party enlivens the proceedings. On other occasions, specially in summer, the patients are allowed to camp out in some part of the estate, and do part of their own cooking, etc. And the camp life can be extended to a caravan, where the senior patients who are nearly well, and who can be trusted, could be allowed to go farther afield, and make a tour of the neighbouring country. In such various ways the patient's interests are roused, his mind relieved of dull monotony and kept from constant introspection, and at the same time the chief object —the arrest of the disease—is ever kept in view.

(*d*) Diet.

The idea current in many quarters, that the patients are overfed and stuffed in open-air institutions, has prejudiced the public against the sanatorium treatment. In the early years of the open-air movement some physicians, by introducing the so-called 'Nordrach treatment,' have helped to foster such an idea. Of late years a wider knowledge has enabled a more rational diet to be introduced in consumptive establishments. I wish to emphasize the fact that a sanatorium is not a place where the patients are indiscriminately fed, but where the diet is regulated according to their need and condition. I strongly disapprove of forcing patients to eat more than they are able. While the physician should

keep a watchful eye over those who would eat more and those who would eat less than they need, in the majority of cases he should be guided both by his own judgment and by the patient's appetite. The nearer the normal state of health of the patient, the more safely his appetite can be taken as a guide. Forcing and stuffing are not necessary in the early stages, and are not of much use in the late stages, when the stomach is too enfeebled to digest any food. It is founded upon an erroneous idea that the more food taken into the stomach, the more it nourishes the system. People are apt to forget that, not the quantity of food, but the efficiency of the gastric organs to digest and assimilate, is the real criterion to go by. Continuous high feeding has been a fruitful source of trouble, such as anorexia, dyspepsia, etc., in the after-life of the sanatorium patients. The gain of weight does not always indicate that the disease is conquered. In some fat and corpulent patients the disease runs an acute course, and, even when they get well, some of them become victims to chronic dyspepsia and gastric derangement. There is no sense in arresting the disease of one organ at the expense of another. As a rule, consumptive patients in the early and curable stage do not require more food than others. When there is a great deal of emaciation, patients should be encouraged to eat more. If they cannot, the condition of the stomach should be looked into, and any error rectified. Generally speaking, the open-air treatment, together with the regular life led in the sanatorium, creates a healthy appetite which requires no compulsion or encouragement. It is impossible to formulate a standard diet suitable to all tubercular patients, as they all differ in age, sex, height, and weight, in the condition of disease, in the digestive capacity, in the amount of exercise they are allowed, etc. A diet constructed from scientific data as efficient and satisfactory does not always work out correctly in everyday practice. Man is a living organism, not a machine, who can be expected to produce a definite known amount of protein and carbohydrate from a given quantity of food. On the other hand, clinical evidence has brought out two points:

(1) Of two patients eating the same quantity of food a day and living under the same conditions, one may get fat and the other may remain thin, one may improve and the other may not. Man's physical and mental conditions that control the processes of digestion and absorption are more important factors in bringing about improved health and resistance than the quantity of food regulated by scientific observations. (2) Different sanatoria have different ways of feeding their patients. Some add more fatty foods, others more protein to the dietary; some others give protein in the form of beans, lentils, peas, etc., instead of meat; and many a working-class sanatorium feeds its patients with plain, simple, and ordinary food, and yet all of them have more or less equally good results. So that there can be no cut and dried system of dieting tubercular patients. The physician should always keep in mind that the aim of the open-air treatment is to bring the patient to a natural state of health, where physiological activities go side by side with physiological economy. In the writer's estimation the secret of successful diet depends more upon attention to economy in diet than by giving way to extravagance. However, the writer will now relate one or two principles that have guided him in dieting his sanatorium patients:

1. He believes in the three-meal system. The stomach is the greatest friend of the consumptive, and, like a wise general, the physician prepares for future eventualities, and does not put too much strain on it, but keeps in reserve all its energy, and economizes its resources for the campaign. Hence, the stomach should have four hours' rest between meals, and, generally speaking, no food should be given between breakfast, dinner, and supper. The more rest the gastric organs get between meals, the better and longer will they serve the patient. In fact, the writer believes that the prognosis of pulmonary tuberculosis depends to a great extent upon the efficiency of the stomach. If it fails for good, not all the artificial or concentrated foods will save the patient's life.

2. Patients with weak digestion should not be overfed.

CARAVAN LIFE FOR SENIOR PATIENTS.

Notice the adjustable roof of the tents

To face page 102.

If, after a few days' trial, large meals produce fulness and discomfort, the food should be cut short, and the stomach given rest. Fasting one meal a week is a good plan that could with advantage be adopted by all sanatoria. So thoroughly did the Brahmins and other ancient people believe in giving physiological rest to the stomach that they exalted the fast once a week to a religious observance, and enjoined it as binding upon both the strong and the weak. The writer has found that some patients who cannot eat are all the better for abstaining from food now and then, as their appetite returns after a while, and they are able to relish their food after the fast. In fact, fasting is a leaf taken from Nature's book. If a horse is ill it will not eat, and man is the only creature that violates the laws of Nature, and floods the stomach with beef-teas and jellies when it is feeble and out of sorts, requiring care and consideration.

3. A certain amount of freedom should be given to the patients as to the quantity of food to be eaten; and the physician will find that this liberty is not often abused. Man is a curious animal. If he knows he is under compulsion to eat a certain quantity of food put in front of him, he chafes under it, and when he forces himself to eat it, appetite or no appetite, it does not do him much good. But when the restraint is judiciously relaxed, and the mind feels the freedom, the patient enjoys the food, and gets more nutriment out of a smaller quantity of food than a larger amount taken under compulsion. But the physician should make an exception in a class of patients—mostly women, and inclined to be neurotic—who are small eaters and below weight, whose tongue is clean, and whose digestion, though not impaired, is weak, inactive, and in want of tone. In such cases, where there is a great deal of neurosis, and, perhaps, sickness after food, the physician should not be guided by the patient's inclination, but firmly and gradually increase the quantity of food. Such patients do well under a liberal diet. When the initial difficulty is got over, and the digestive organs put into an active, working capacity, the patients increase in weight and keep well.

4. The following is the ordinary diet for a male patient:

Breakfast, 9 a.m.

Shredded wheat or porridge and milk.
Bacon or ham, 2 ounces; or fish, 3 ounces.
One egg.
Toast and bread, 3 ounces; butter, ½ ounce.
Tea or coffee, made with milk; marmalade.
Milk, 8 ounces.

Dinner, 1.30 p.m.

Soup (to which peas, beans, lentils, vermicelli, or barley are added) or entrée.
Meat, 3 ounces; potatoes, 3 ounces; green vegetables.
Suet-pudding, 3 ounces; bread, 2 ounces; butter, ½ ounce.
Cheese and biscuits, fruit and coffee.
(Fresh fruit twice a week; stewed fruit other days.)
Milk, 16 ounces.

Tea, 4 p.m.

Tea and one piece of bread and butter, or a piece of cake. (This is optional.)

Supper, 7 p.m.

Meat, 2 ounces; or fish, 3 ounces.
Potatoes, 2 ounces.
Milk-pudding, 4 ounces; stewed fruit.
Bread, 2 ounces; butter, ½ ounce.
Cocoa (Fry's malted cocoa) made with milk; milk, 8 ounces.

The women patients' dietary is one-fourth to one-fifth less than the above diet.

Patients taking an ordinary diet do not require 3 pints of milk. Large quantities of milk poured into the stomach are apt to interfere with gastric digestion. When patients first come into the sanatorium we begin with three glasses of milk a day (each glass holds 8 ounces), which is increased to four, and after to five, glasses a day; five glasses of milk with the porridge, coffee, and cocoa milk come to 45 to

50 ounces a day. And as patients improve this is cut short to 24 to 30 ounces of milk a day, and in some it is still more reduced before they leave the sanatorium. Some patients with a feeble digestion do better when the milk is cut off at meal-times and a smaller quantity given an hour or so after the meals. If the patient cannot eat, and is losing weight, the milk is increased to six glasses; but if he takes a dislike to milk, it is best to give him no milk for a time, and then begin with half a glass a day, and gradually increase it.

We do not sterilize the milk. We take every precaution that the cows reared on our farm are sound, and are free from tubercle, and give the patients fresh milk. The writer believes that sterilization destroys something 'living' which seems to be essential to the wholesomeness and the nutritive value of the milk. Our patients have done better since the milk has not been sterilized. Fresh milk is proved to have distinct bactericidal properties which make it safe to drink.

5. The dyspepsia associated with early cases is soon overcome after the patient enters the sanatorium. The change of air and better hygienic conditions enable him to regain his appetite quickly. If the digestive system is not impaired, the ordinary diet is given, even when there is a great deal of fever. When there is a great deal of anorexia, especially in the later stages of the disease, the arrangement of the patient's diet requires much care and consideration. When one remembers that an efficient stomach is the greatest asset of the consumptive, one can understand the necessity of adopting every means to help the gastric organs to do their work. In some cases more or less abstinence from food for a day or two gives opportunity for the stomach to recover its digestive functions. In others the bulk of food is reduced, and more concentrated diet is prescribed, such as cream, raw eggs, egg-flip, Benger's food, junket, sheep's or calves' brains, meat sandwiches, etc. In more obstinate cases of dyspepsia the diet chiefly consists of raw-beef juice (juice freshly prepared from minced raw beef by a cold process with a special machine), scraped underdone meat spread over thin pieces of bread and butter, small quantities of egg

beaten up with milk and sugar, bone-marrow, or Virol made into bread-sandwiches, etc. Where anorexia is accompanied by loss of weight we have obtained very good results by administering a teaspoonful of Virol in a little warm milk three times a day. We find Virol a better substitute for supplying fat to the system than cod-liver oil, as it is made from bone-marrow, with malt-extract and eggs, in the form of emulsion. It is especially found useful in tuberculosis associated with anæmia, in cases of convalescence from hæmoptysis, and in those complicated with commencing diarrhœa where the intestines are threatening to be involved. In fact, after using Virol for some years in the sanatorium, we have found it a trustworthy preparation that has helped us to tide over many a difficult case by repairing waste and building up the body by furnishing fat and flesh-forming material.

Again, when the patient's appetite fails after he has been a few months in the sanatorium, and in spite of a liberal diet he does not gain in weight, we have found great benefit from the use of Sanatogen, which has an important dietetic value in the treatment of pulmonary tuberculosis. It is a compound of 95 per cent. of pure casein of milk and 5 per cent. glycero-phosphate of sodium, and experimental research has demonstrated that the organic phosphorus contained in the preparation is almost entirely taken into the system. From our own clinical experience we can say that Sanatogen increases the power of assimilation of food, and restores the general nutrition of the body. In our sanatorium its chief indication is found in consumptive cases of a stationary type, where the patient's improvement comes to a stand-still from defective nutrition, and in cases accompanied by neurasthenia, with irritable condition of the nervous system, palpitation of the heart, and rapid pulse, where it gives tone and resistance to the nervous tissues, helps the gastric functions, and improves appetite. The secret of its beneficial effects in tuberculosis lies in its power of proteid absorption and in increasing the nutritive value of other diets. Sanatogen is best given in teaspoonful doses, mixed with milk or

cocoa, during or immediately after meals. As for drugs, we have not found that the internal administration of drugs has any specific action in the cure or arrest of tuberculosis. For some years we have been in the habit of giving hyd. subchlor. in the form of a pill once a week almost to every patient. Now and then we find it necessary to give a sleeping-draught, or a tonic such as the following, when a patient has a furred tongue or a poor appetite:

Acid. nit. hydrochlor. dil.	...	...	...	℥viii.
Acid. phos. dil.	...	...	...	℥v.
Tinct. nuc. vom.	...	...	...	℥v.
Tinct. card. co.	...	...	...	℥xxx.
Inf. gentian. co.	...	...	...	ad ℥ss.

T.d.s. in water after meals.

In all these and various other ways we try to overcome dyspepsia and allied disorders by helping and strengthening the digestive organs. We have found the uselessness of forcing large quantities of food upon a patient when he cannot eat.

The physician soon begins to recognize that food is not everything in pulmonary tuberculosis; that it is only a means to an end; that a large amount of it can no more cure consumption than a large amount of fresh air or rest. The state of the mind explains to a great extent the anomalies observed in different patients. Clinically, it is seen that large quantities of food bring no corresponding strength to the patient, who sometimes actually loses under a big diet, and gains under a smaller one. If the food is influenced by digestion, the process of digestion is influenced by the condition of the mind. Therefore the physician, in fighting with this disease, tries to ascertain the state of the patient's mind, and by allaying his fears, by encouraging him when depressed, and surrounding him with an air of cheerfulness and contentment, brings to his aid psychic forces to create a healthy appetite as well as a healthy mind. In fact, like a wise commander, he uses all kinds of weapons in the battlefield to strengthen the patient, to increase the resistance, and to conquer the enemy. He is here, there, and

everywhere in the sanatorium treatment, and he makes his influence felt in all directions. This brings us to the last item in the treatment.

(*e*) Medical Supervision.

The sanatorium treatment is more than fresh air, and regulated rest and exercise, and good food. The master-hand of the physician is necessary to take these elements and prescribe them according to the need and requirements of each patient. The success of the sanatorium largely depends upon its chief, the head. It is he who directs the whole machinery, and gives life and stimulus to the whole treatment. His personality is everything, and is made up of his insight into character, patience, perseverance, abounding confidence in himself and in the methods he adopts, sympathy which does not outrun a certain amount of discipline, and discipline not rigid and severe as if he were training a band of soldiers. Discipline supplements ignorance. The Germans are born to discipline, and where they do not understand they follow, and so the right thing is done. But here in England the patients are not used to discipline, and it cannot come to their help when they are ignorant; thus many a patient slips between want of discipline and strictly following the leader, and want of knowledge and doing the correct thing.

The sanatorium physician must be full of enthusiasm. Unless he is enthusiastic he will soon lose heart, if he is at all sensitive; for his work is very exacting, and often thankless. Besides having to fight the many phases of the disease, he has daily to meet many idiosyncrasies, temperaments, and prejudices. To bring the patients to his way of thinking, to infuse order and discipline out of chaos, and inspire confidence and enthusiasm in dry bones, is no easy matter. It requires statesmanship, a wide knowledge of human affairs. He will also be called upon to correct wrong tendencies, to rectify bad habits of a lifetime, to encourage sympathy and foster good feeling, and raise the ideal of patients. Really speaking, the sanatorium is not only a place of healing, but

where the patients are educated in right thinking and right living. Many of the patients that come under the sanatorium régime have no other resources of keeping their minds occupied beyond their profession or calling, so that when they find themselves temporarily cut off from their daily work they do not know what to do with themselves, and so they try to fill their minds with the miserable bits of knowledge provided by the daily papers, or resort to questionable amusements. Therefore to relieve dull ennui, to divert their minds from dwelling too much upon their disease, to widen their outlook and interest, and instil a desire for reading books of useful knowledge that shall raise their tone and elevate thought, become part of the work of the physician. By constant supervision, by judicial repetition of advice and warning, by close watching, by regular irregularity, and not too much system and method, but discipline tempered with relaxation, he attacks disease from all points, and brings about its arrest by appealing to the physical, mental, and moral sides of his patients. He may meet with many disappointments and failures; he may often be disheartened by selfishness and ingratitude; but he must keep his ideal ever high — the ideal of doing good to suffering humanity. Strong, brave, enthusiastic, he must ever mount his solitary bridge and keep his lonely vigils on the ship, knowing that in his right steering lie the welfare and the safety of those who are slumbering under his care and protection.

CHAPTER III

THE RESULTS OF SANATORIUM TREATMENT

THE statement that statistics are fallacious finds no better illustration than when an attempt is made to compare and classify the results of the open-air treatment in various consumptive sanatoria. A disease like consumption, with its insidious beginning, its many clinical varieties, its chronic course, and gradual amelioration of one or more symptoms till health is slowly established, presents such a wide basis that it does not easily lend itself to such strict statistical control as measles or smallpox, which present distinct symptoms and run a definite course. Hence any classification either of the disease or its cure is met with many difficulties. For instance, can we classify pulmonary tuberculosis according to its different stages or its symptoms, or according to the number of lobes involved? The terms 'early,' 'advanced,' etc., are not only vague and elastic, but what one physician would consider early symptoms another might think moderately advanced; or the symptoms of the first stage may shade off into those of the second, the second into those of the third. If the extent of the disease is to be expressed by the number of lobes affected, while in one case two lobes may be slightly affected, in another one lobe may be diseased in an advanced cavity stage. When we come to form some idea as to the termination of the disease, we are confronted with fresh difficulties. What is the evidence of cure or arrest of pulmonary tuberculosis? (*a*) Not the absence of tubercle bacilli in the sputum. Many patients who leave the sanatorium strong

and well have bacilli in their expectoration; on the other hand, a patient may be very ill, and very badly affected, and still he may have no bacilli in the sputum, or no expectoration. (*b*) Not the absence of temperature; for extensive disease of the lung may be accompanied by a normal or subnormal temperature. (*c*) Not the absence of cough or expectoration; for some of the patients who are discharged from the sanatorium fit for work bring up expectoration for months after. (*d*) Not increased weight; a lean patient is often more capable and efficient than a fat and florid one. Again, when we come to look at the terms 'cure,' 'arrest,' etc., what one physician would report as cured another

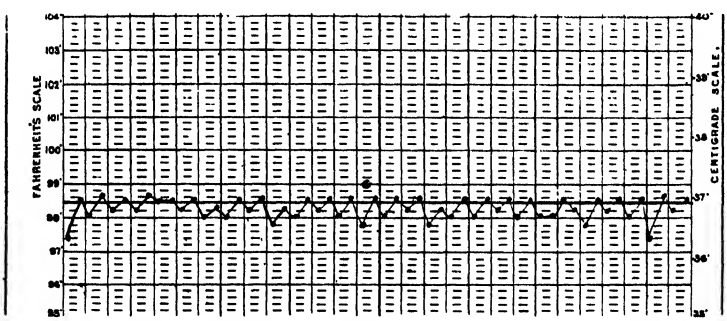


FIG. 4.—SHOWS A NORMAL TEMPERATURE IN A PATIENT WITH EXTENSIVE DISEASE.

would say is arrested. Besides, the disease may be cured in one part, and arrested or improved at another part of the same lung. But for a correct appreciation of results of the sanatorium treatment one must know the extent of disease when a patient enters an establishment. Hence some kind of classification becomes necessary to mark what the treatment has done. And to avoid much confusion and error it is wise not to go in for an elaborate analysis, but to make the classification simple, and at the same time clear and definite, so that it may be easily understood and adopted by all the sanatoria. For instance, I would divide all the cases that enter a sanatorium into early, moderately advanced, and advanced. In the early cases I would include

all those which are seen to be in the various periods of the first stage, up to the time when the bacilli have appeared in the sputum. They will include all those which present dry physical signs, with a temperature varying from normal to below 100° F., where there may be cough, but no expectoration and no bacilli.

The second division will include all those cases which have begun to expectorate, with or without tubercle bacilli, where one or two lobes are affected, and the temperature is normal or moderate, being below 101° F., and where the gastric functions are unimpaired, and the patients are able to take their daily exercise.

The third will include all cases of advanced cavity stage, or in which disease is extensive, with a hectic temperature going up to 102° F. or more, which present symptoms of mixed infection, great emaciation, rapid pulse, gastric disturbance, and intestinal complication.

The return of health can also be classified under three headings. The first will include cases of complete restoration presenting more or less all negative symptoms—viz., no physical signs, no cough or expectoration, or bacilli, or temperature. The second will include cases arrested or greatly improved, where the physical signs, expectoration and bacilli, have not entirely disappeared, but where the patient feels well and strong enough to do some work. The third will include all those who have made little or no improvement. The practical results can also be classified in three divisions. In the first the patient will be fit for ordinary work, in the second for a little less than ordinary, or for light work, and in the third for little or no work. As pulmonary tuberculosis is better studied and known by the physician, I take it that he will not let his patient reach the advanced condition, but will be able to grapple with the disease in the early stages. Already one does not see in the sanatorium so many of the severe types of the disease as one saw in the early years of the open-air movement. The sanatorium treatment seems to have modified the type and course of the disease. So that the classifica-

tion in the future will fall under two such headings as the following:

Early Cases.	*Advanced Cases.*
1. Little or no temperature. Dry physical signs. No expectoration or bacilli.	1. One or two lobes affected. Moderate temperature, if any. Cough and early expectoration and bacilli. Appetite good. Patient able to take exercise.
2. Cure or permanent recovery.	2. Arrest of disease. Few or no physical signs. A little expectoration and a few bacilli.
3. Patient fit for ordinary work.	3. Fit for light work to begin with.

Results of the Treatment.—In giving the results, I have studiously avoided making any elaborate statistics or tabulating annual figures. There is no real value in compiling yearly results, as one year one may have more early and in another year more advanced cases, the results varying accordingly. Also I have not made separate tables for early, moderately advanced, and advanced cases. For the first few years, mostly moderately advanced and advanced cases entered the sanatorium; besides, the supposed 'early' cases during their stay soon passed on to the second, the second into the third stage. Moreover, my object is not to confuse the reader with a minute analysis of results which may or may not have any significance, but to give figures that would prove the efficiency of the sanatorium treatment as shown by the patient's capacity to return to work and to continue in it, which is, after all, the crux of the whole question. Exclusive of patients who did not stay more than a month, the number of patients who were discharged from August, 1889, to August, 1908, was 339, of whom five cannot be traced. Of the remaining 334 patients, 177 were either apparently cured, or their disease arrested, so that they were able to follow their old or some new occupation. This means that about 52 per cent., or a little more than half the number of patients that entered the sanatorium, have recovered, and are living at the present day. Among the rest I include all those who have

either slightly improved, or made no improvement, or died. This percentage of recovery would have been greater had some of the patients who had every prospect of getting well remained in the sanatorium a little while longer to complete their cure. It is very encouraging that, thanks to the vigilance of the medical men, more early cases have come in for the treatment during the last two or three years than they did before that time. If patients could only be induced to begin treatment at an early stage, the percentage of cases completely restored or arrested would be very much higher. But as it is, all the sanatoria are loud in their cry that they do not get sufficiently early cases to do justice to the open-air treatment.

About 80 to 85 per cent. in the early stage, 40 to 45 per cent. in the moderately advanced, and 8 to 10 per cent. in the advanced stages got quite well—*i.e.*, well enough to take up their old or some new work. In about 7 per cent. of cases there was no sputum; these were mostly early cases. In about 26 per cent. no tubercle bacilli could be found; some of these had extensive disease of the lungs. Only in about 67 per cent. were bacilli found in the sputum.

Duration of Treatment.—The length of stay to bring about recovery is about six months in the early stage (the shortest time being about five months), nine to twelve months in the moderately advanced, and two winters and a summer in the advanced stages. The duration of the treatment has a very important bearing on its success. It is utterly absurd to expect, as some have done, to cure a patient, or even arrest the disease, in three months. There is no doubt some truth in the insinuation that the patients who have been partly patched up by the open-air treatment, and return to unhealthy surroundings, relapse more quickly than those who have remained in the old conditions of life, simply because half a cure is worse than no cure. A creaking door lasts longer if left alone, because everyone knows its deficiency, and uses it carefully; but it looks strong when it is half mended and painted, and the first careless knock breaks it to pieces. The open-air cure is, I am sorry to say,

long and tedious, requiring great patience and perseverance on the part of the physician and the patient. It is Nature's cure, and Nature builds well, but slowly. The causes of failure of sanatorium treatment are mainly due to—

1. Medical men not sending their cases at an early stage.
2. Patients who at the first sign of return of health go home thinking they are cured.
3. Institutions which cannot keep patients for more than two to four months, and then send them back to their former unhygienic surroundings.
4. Treating patients at home when no medical supervision or discipline is possible.

The value of time in the treatment of consumption is seen in two ways. (1) When the disease is diagnosed, no time should be lost in getting the patient away. For the enemy has already been entrenched in the lung for some months, and every day lost is gain to the microbe, which is ever vigilant, and steadily extends its deadly work, pouring out its toxins, and vitiating the blood and the tissues. Hence both the patient and the physician should quickly set to work before the enemy gains a foothold. And, alas! when it gets a strong foothold, as seen by the soft and rapid pulse, the hectic temperature, the steady loss of flesh, anorexia and diarrhœa, the treatment will not avail much. Therefore time should be taken by the forelock, and the treatment should be begun as early as possible. (2) The patient should continue in the treatment with a dogged determination. The most important cause of failure in my experience is that patients either have no means to continue the treatment for long, or have not the patience to persevere in the sanatorium régime. At the first sign of return of health they leave the sanatorium and seek more congenial surroundings. Rigid discipline, cold, absence from home and friends, etc., are unpalatable, and it is most difficult to convince patients that health can only be got back at a great sacrifice—that Nature demands strict conformity to her laws. It is one of the signs of this decadent age that patients have not the strength of

character or stamina to stand fast, and strenuously continue in the fight with the disease.

I go further, and say that the question of arrest of the disease is more a matter of a patient's perseverance in the treatment than even whether he comes under treatment at the first, second, or any stage of the disease. This may be a bold statement to make, but nevertheless it is my experience. Over and over again I have known patients who came to the sanatorium in the early stage, and who returned home too soon, partly patched up, with the result that after a few months they succumbed to the disease. On the other hand, I have known others who came to be treated in the cavity stage, and with very little resisting power, but who have persevered for two or three winters, and are living now to testify to the efficacy of the open-air treatment. Of course, I exclude from the present consideration those cases which seem to go wrong from the very beginning, and which get steadily worse in spite of every care and attention. We do not understand at present the laws that underlie these cases; some day we shall. I also exclude those cases of advanced stage where gastric functions are deranged, and the process of assimilation and excretion is poisoned by toxins and other products of pathogenic organisms. But apart from these cases, broadly speaking, the failure or success of the treatment depends more or less upon the patient himself. In other words, the amount of vitality and fighting force determine the prognosis of almost every case. The sanatorium treatment increases the resisting force of the patient. If he perseveres in the treatment, there is every probability of his increasing his vital force and of overcoming the disease sooner or later.

On the other hand, I foresee that the sanatorium treatment will be brought into bad repute, because patients, from lack of time or means, from lack of inclination or strenuousness, will desire to get well in a hurry, and cannot. There is no short-cut to Nature's cure; she works slowly, but surely. The earth takes just as long to go round the sun as it did some hundreds of years ago, and it has found no short road

yet. Various remedies have been brought forward from time to time and exploited as speedy cures for the disease, but they all have been failures so far. Nature cannot be tricked to cure a patient in this way. She proceeds step by step, line upon line, and health can only be regained by strictly adhering to her laws; and the result of perseverance is a sure and certain success in many cases.

The success of the open-air movement is not merely to be gauged by the number of lives it has been the means of saving, but in a greater degree it is seen by the way in which it opens up larger issues, and rouses the nation to see the evil tendencies of modern thought and modern life, suggesting reforms along national, social, and municipal lines. Tuberculosis is one of the evils of present-day civilization. As long as there are crowded centres like London, Manchester, and Liverpool, which are breeding-places for dirt and microbes, one can never hope to eradicate consumption. It is like trying to bale out water from a ship that has sprung a leak. As fast or faster than you can pump, the water rushes in through the hole and fills the ship. As fast as you can cure patients, their places are filled up by others manufactured by the crowded and dirty towns.

Besides, tuberculosis goes hand in hand with other evil factors in the vicious circle—viz., competition, overcrowding, poverty, drink, a life of bustle and excitement—all of which tend to keep man at high tension and irritation, giving him no time for the recuperation of vital forces, which are necessary for the maintenance of his health. Nature not only needs time to build, but also rest and quiet to do her work. In silence she manufactures in her secret laboratories the vital energies required to maintain life's functions and duties. Mere giving attention to sanitation, or building large sanatoria for consumption, is like sprinkling carbolic powder over the leakage of drain-pipes. The sanatorium treatment is only a part of a great movement which aims at going to the root of the matter. Like the ever-widening circles caused by a stone dropped into a still lake, it tends to widen the outlook and extend its reforms from one disease to the prevention of all

disease, and never rests till it has taught the nation to regard the health of its citizens as a sacred heritage, which it should guard at all costs and against all enemies. Looking thus from a broad point of view, the sanatorium treatment can never be regarded as a failure.

Sanatorium versus Home Treatment.—While it is not impossible to pursue the open-air treatment at home, in the writer's experience it has many drawbacks as compared with a sanatorium, where all the improved means and facilities are available to carry out the treatment to the fullest possible extent. (1) It is better for the patient to be treated away from home. The change of air, the change of surroundings, the absence of unwise and mistaken sympathy of friends and relatives, who are apt to interfere with the treatment by frequent visits and wrong advice, all make it desirable for the patient to be removed to a sanatorium. (2) In how many private families is it possible to obtain the conditions necessary for the successful carrying out of the treatment—viz., a house in the country, situated in a dry soil, away from the dust and smoke and noise, with protection from winds, which has a garden large enough for the erection of a shelter where the patient can take his rest in quiet and privacy from the intrusion of neighbours? (3) Even if the necessary conditions are forthcoming in a private house, without medical supervision they are of as much value as a sumptuously appointed ship without a captain to guide it. And how few will have the courage to go steadily and faithfully through the daily routine, and take their exercise and keep the hours of rest, and forgo the visits of friends and relatives, week after week, and month after month! When a person is struck with a mortal disease his nervous system is undermined and his will weakened, and he requires the gentle guidance of a strong hand to advise and help him over the crisis. As we have seen in the last chapter, the success of the treatment mainly depends upon the unremitting care of the physician, who by his enthusiasm and perseverance constantly encourages the patient to carry out the very details of the treatment. Of course, the nature of

the disease may be such that it may not be possible to remove the patient from home, or the illness may be so slight that home treatment may be considered sufficient. But in all cases where the disease is pronounced, and the patient is fit to travel, and where speedy arrest of the disease is an economic necessity, a well-conducted sanatorium offers the best prospect.

England versus Foreign Countries.—As tuberculosis prevails in all countries, from low-lying Holland to the high Rocky Mountains, and in all climates, from tropical Africa to arctic Greenland, so it can be successfully treated in all parts of the world under varying climatic conditions. And in the majority of patients it is immaterial where they carry out the open-air treatment, the selection of a place being more a matter of expediency and economy than any other consideration. Consumptive patients living in Great Britain can choose any part, provided it is in the country, and protected from strong high winds, and is preferably at an altitude of between 400 to 800 feet above the sea. This elevation insures a dry soil and bracing air. Having had a seaside sanatorium previous to the present one, the writer can speak from experience when he says that patients after a time do not make satisfactory progress near the sea-coast. Whether this is due to the salt air, or the strong sea-breeze exciting a cough, or to the low altitude, or all combined, one cannot be certain. I should think that patients who live in this country, and have their family and business connections, are better treated here. The cure or arrest affected in England, with its uncertain and variable climate, is more satisfactory than where the climate is more mild and favourable. However, well-to-do patients, who have ample means and time at their disposal, and who desire to carry out the treatment in pleasure and comfort, may prefer to go on the Continent, where better weather conditions and more sunshine would induce them to spend a large part of the day out of doors. But whether treated at home or abroad, the one condition for success is not a fine climate, or a high altitude, or a dry soil, but strict and

faithful compliance to the principles of the treatment as indicated in the previous chapter. When once the disease is arrested, the patient will be greatly benefited by a change of air to the seaside, or a visit abroad, or a short sea-voyage where it is possible to remain on deck the whole of the time. A long sea-voyage which compels the patient to spend his time in a stuffy cabin with one or more passengers would nullify all the good effected by the treatment, and is strongly to be condemned.

CHAPTER IV

SOME INTERESTING CASES OF RECOVERY

If the whole story of sanatorium experience were known to the public, few cases of recovery would be seen to be more thrilling and romantic in the annals of medicine than those which have been saved from the jaws of consumption by the open-air treatment. Every sanatorium knows of such cases. If the roll could be called, it would be found that men and women eminent in science, in art, and in letters, preachers and physicians, actors and artists, teachers and nurses, men engaged in commercial and industrial enterprise, as well as many in the humbler ranks of life, who were laid low by this dreadful scourge, have come forth triumphant, and have returned to their daily vocations. Pages could be filled with such interesting cases of recovery taken from all classes of patients. If the ideal of life is to seek and promote the happiness of others, then surely the physician stands first and foremost among the noble band of reformers and benefactors of mankind.

Here is a batch of cases treated in an early stage:

No. 1.—Mr. H., from Scotland, aged thirty-two, single, shipbuilder. Disease confined to the left apex; sputum contained tubercle bacilli. Recovered in seven months, and went back to Glasgow to his work.

No. 2.—Miss B., aged forty-three, a lady teacher and graduate. Both apices affected; highest temperature, 99·2° F.; no expectoration. Recovered in eight months, and is doing some work.

No. 3.—Miss M., a young lady, aged twenty-three.

Early consolidation of both apices; anæmic; the temperature varied from 98·4° to 100° F. Got well in ten months; now travelling abroad.

No. 4.—Mr. B., a clerk, aged twenty-two, with early infiltration of left apex; gained 16 pounds in weight. Disease arrested in five and a half months; gone back to work.

The next group are early cases beginning with symptoms of pleurisy.

No. 5.—Miss N., middle-aged nurse. History of several attacks of pleurisy on the right side. On examination, complete dulness over right base, back and side; cogwheel and sibilant râles and fine crepitation over right apex in front; temperature went up to 99·6° F. for about eight weeks, and then came down to normal. Entirely recovered, and resumed her work.

No. 6.—Mr. B. W., medical student from the North. History of pleurisy of right side; absolute dulness over right base; crepitant râles over right apex; the temperature now and then went up to 99·2; no sputum. Got quite well, and since was qualified and is in practice.

No. 7.—Mrs. P., from the east of London. Right pleurisy; was previously tapped, and 98 ounces of fluid were withdrawn; absolute dulness of right base, with cogwheel, harsh breathing, prolonged expiration at both apices; the temperature went up to 99·4° F., sometimes to 99·8° F.; no sputum. Made a good recovery.

No. 8.—Mr. W., aged twenty-two, a builder's son. Pleurisy left side; was previously tapped, and 3 pints of fluid were withdrawn; heart displaced; absolute dulness over left base; fine crepitation over the axillary region as far as the left nipple; gained 22½ pounds in weight. Has gone back, and is working with his father.

In these cases, besides the presence of early physical signs, dulness remained even after being tapped, and only slowly cleared after months of open-air treatment.

The next batch are cases of hæmoptysis:

No. 9.—Mr. H., from Cambridge, aged thirty-two. The hæmoptysis, that lasted ten days, was so severe and so alarmed

the patient that he sought advice immediately; impaired movement and fine crepitation over both apices, more marked on the left; temperature; after going up for a few days to 98·8° and 99° F., remained normal; no sputum. Gained 20 pounds, and got quite well in seven months and two weeks, and is now at work.

No. 10.—Mr. D., aged thirty, a commercial traveller. Had a severe hæmoptysis while travelling in Norway, lasting for fifteen days; both apices were involved; impaired movement and crackling râles; the temperature went up for a few days to 99·2° F.; good steady pulse. Got quite well in nine and a half months, and has gone back to work.

No. 11.—Mr. H. B., a ship's engineer, aged twenty-seven. A case remarkable for repeated attacks of hæmoptysis while at sea, each attack (he had about fifteen to twenty) lasting about ten days; the heart normal; infiltration of right and left upper lobes; dulness and crepitation more marked on the left side, front and back. Patient made great improvement, and in four months the disease was considerably arrested; had he stayed a few weeks longer, he would have been completely restored.

The above three were early cases, and my experience has been that hæmoptysis at this stage very seldom proves fatal, and when treatment is begun at once, patients make a good recovery, with very few exceptions.

The next two are cases of hæmoptysis in patients with extensive disease.

No. 12.—Dr. W., aged twenty-six, single, working in hard colliery practice. Severe hæmoptysis; his voice also affected; both the two upper lobes of the right were involved. Did very well while in the sanatorium: gained 19 pounds; the voice got clear; the disease was considerably arrested, and he would have got well had he remained a little longer.

No. 13.—Mr. A. C., aged twenty-two, a clerk in a shipping firm. Extensive disease of both the lobes of the left lung, and the right apex also involved. The patient had a keen appetite, and very soon gained 18 pounds; had severe attacks of hæmoptysis while in the sanatorium, each lasting

about ten days. He represents a class of cases in which, while the predisposing cause of hæmoptysis is some weakness of a bloodvessel or aneurism in the diseased lung, I believe it is expedited by the patient's full-blooded condition. These patients, in doing full justice to the sanatorium diet, make so much blood that they become plethoric, and blood-pressure rises high; hence the rupture of the bloodvessel in the weakest part of the diseased lung. Some of these patients suffer from epistaxis; both the hæmoptysis and the epistaxis are much safer than the hæmorrhage into the lungs, as they act like a safety-valve, and reduce the blood-pressure. Another interesting lesson taught by these cases is that almost all consumptive patients suffering from a congestive type of the disease do well in spite of the hæmoptysis.

The next is a batch of advanced cases.

No. 14.—Mr. G., aged twenty-four, single, by profession a draughtsman. Mainly the right lobes were affected; a large cavity at the right apex; continuous fever for twelve weeks; and after an interval of sixteen weeks, when the temperature went up in the evening to 99·2° F., another continuous rise for sixteen weeks, when the temperature ranged from 99·8° to 102·2° F.; then it came down to normal. The patient was twelve months under treatment, and made an excellent recovery, and is now in active employment in South America.

No. 15.—Mr. R., aged twenty-nine, single, a clerk in an insurance office. Non-febrile case. Extensive disease of the right lobes and the apex of the left; right testicle tuberculous, and had to be removed. The patient left the sanatorium quite well, and is at work.

No. 16.—Mr. J. K., aged thirty-four, married, two children. The disease began by an attack of pneumonia, when the temperature went up to 106·2° F., and fever continued for five weeks, the temperature often going up to 104° F. The pneumonia was followed by a big excavation, involving the upper and a part of the lower lobe, which, after eleven months of sanatorium treatment, healed up with fibrous tissue.

The writer's experience has been that when tuberculosis is ushered in by a short attack of pneumonia, the patient often gets well, and quicker than when the disease begins insidiously and takes a chronic course. Cases like the above open up doubts as to whether tuberculosis is primary or secondary to pneumonia, or whether the germs of tubercle bacilli have been developed from pneumococci which are often present in the tuberculous sputum.

No. 17.—Mr. S., aged thirty-three, single, an officer in the army, was six years in active service in South Africa, and served in two campaigns. The patient was 'diseased all over.' Both the testicles were tuberculous, and had to be removed; the right hip-joint was diseased, and was operated on; passed albumen very frequently; there was curvature of the spine; had two attacks of hæmoptysis; both the upper and middle lobes of the right side were affected; but the temperature never rose above 99·4° F. The patient made a good recovery, and is engaged in fruit-farming in California.

Various Cases.

No. 18.—Mr. S., a fine, well-built patient, weighing 12 stones. Disease well marked in the left apex. Under treatment the temperature came down to normal, and disease became quiescent. The patient ate and slept very well, and went through all his exercises, and left apparently well recovered, though his expectoration contained tubercle bacilli. He represents a class of patients who, in spite of the presence of tubercle bacilli in their sputum, enjoy good health, all active mischief being arrested, and carry on their daily work after they leave the sanatorium.

No. 19.—Mrs. R., a young married lady, with infiltration of the left apex and affection of the throat; the left vocal cord congested; the voice husky, and swallowing rather painful. After absolute silence for three months the voice came back, the throat healed, and the disease was arrested in six months.

No. 20.—Miss J., aged thirty-two, a nurse, very neurotic and excitable. The case is remarkable for its high temperature without any corresponding extent of lesion. Both apices were slightly affected, but the temperature was continuous, going up to 102° and 103° F. in the evening. The pyrexia could not in any way be accounted for, except that the patient kept it up by her highly nervous temperament. She got quite well, and is now doing active work.

No. 21.—Mr. W. D., aged thirty-three, of independent means, single. A restless patient, with roving disposition. Infiltration of both apices. After a few weeks' stay in the sanatorium, got a fixed idea in his head that if he travelled from place to place he would get well. So the patient went about visiting all places of interest and importance in England and abroad, sleeping as far as possible in the open air, walking for miles, climbing hills, living on simple fare, and retiring every night to bed early; and after ten months, on examination, there was complete absence of moist sounds, the temperature normal, and pulse between 70 and 80. The firm determination to get well, together with the tramping for miles in the open air, enabled him to throw off the disease. While this case proves that Nature knows more than one method of cure, it cannot be taken as an example for everyone to follow.

The following two cases show that, when the disease takes a chronic course, the presence of tubercle bacilli cannot be always depended upon:

No. 22. CAVITY OF THE LUNG.—Philip W., aged thirty-two, clerk. Signs of large cavity of left lung; very little expectoration; temperature subnormal. Only twice during an interval of two and three months could any bacilli be found.

No. 23. CHRONIC FIBROID TUBERCULOSIS.—May F., aged twenty-eight. Suffered for a long time with cough and expectoration; loss of weight; a little pyrexia; impaired resonance and diminished expansion over the right lung; fine crackling râles; creaky sounds; expiration prolonged; shortness of breath. No bacilli during the period of six months.

The following are examples of cases of other diseases

presenting symptoms and physical signs like those of pulmonary tuberculosis:

No. 24. SUBACUTE PNEUMONIA WITH LATE RESOLUTION.—A. D., aged thirty-five, married, had pneumonia about three months before he came under my observation; complained of loss of flesh, cough and expectoration, fever, and night-sweat; temperature ranged from 97° to 100° F. A few weeks after admission into the sanatorium his temperature became normal. On examination there was dulness over the whole of the right lung, front and back; bronchial breathing, fine and medium-sized râles, expectoration abundant and muco-purulent. No bacilli in the sputum after repeated examination. After four months' stay the patient recovered completely.

No. 25. SYPHILITIC PHTHISIS.—E. F., aged thirty-nine, of independent means; father died of 'consumption.' Gave a history of syphilis; had hæmorrhage, cough with expectoration, shortness of breath; temperature ranged from 97·4° to 99·4° F., going up to 100° F. once or twice. On examination there was a dulness over the left upper lobe; bronchial breathing, moist crepitation, abundant muco-purulent expectoration. No bacilli after repeated examination. Was treated with potassium iodide; at the end of three months was convalescent.

No. 26. CHRONIC BRONCHITIS WITH ASTHMA AND EMPHYSEMA.—L. B., aged thirty-four, came with a history of hæmoptysis, wasting, asthma, cough and expectoration; temperature ranged to 99·2° F.; pulse 90 to 100. On examination there was loss of resonance over both lungs, more so on the right than on the left, but dulness was not definite except at the bases; moist râles all over, and fine crackling râles over the bases, owing to œdema; expectoration muco-purulent, sometimes frothy. No bacilli in the sputum. Six months after the first examination the patient developed pulmonary tuberculosis.

No. 27. A CASE OF PNEUMOMYCOSIS.[1]—The patient was

[1] This case was published in the *West London Medical Journal*, October, 1901.

a young woman, aged twenty-eight, and unmarried. She came to me in October, 1900, complaining of shortness of breath, night-sweats, cough and expectoration, from which she had been suffering for six months previously, and losing flesh all the time. She had attacks of dyspnœa and palpitation of the heart. Her family history was good, both her parents being alive and well. She was rather pale and thin; had paroxysmal cough, shortness of breath on exertion; was subject to ulcers in the mouth, and indigestion. She had a few aphthous patches when I saw her. On examination there was slight dulness over the right apex, front and back; expiration prolonged; breathing harsh and bronchial over the same area; moist râles and whistling sounds were heard over both lungs. The heart's action was quick, the pulse rapid, varying from 100 to 110. The temperature ranged from 98·4° to 100° F. The expectoration was copious, and varied in character. At one time it was clear mucus, at other times it was frothy and muco-purulent; on a few occasions it was streaked with blood. Her throat was congested. No tubercle bacilli were found on repeated examination of the sputum, but the field was covered with tangled mycelial threads, varying in thickness, with lateral branches, the filaments evidently belonging to the order of thrush fungi.

Treatment.—She was put under the open-air treatment and inhalations of formaldehyde. She was out in the open air a great part of the day, took a little exercise daily, and plenty of rest. Beyond an occasional pill or two, and local application of chlorate of potash and borax, no special medicine was prescribed to be taken internally.

Progress.—During the first two months under my care she felt very weak, had no appetite, was short of breath, and brought up abundant expectoration. However, she began to improve at the beginning of the third month. The cough became less frequent, temperature kept normal, the expectoration diminished. She was able to take food better, and her exercise without fatigue. The filaments decreased considerably, till, at the end of the fourth month,

they entirely disappeared. At the beginning of February, 1901, she got quite well and went home.

I am more inclined to call the disease *bronchomycosis* than *pneumomycosis*, as, with the exception of slight dulness over the right side, a little temperature and rapid pulse, it has more in common with bronchitis.

CHAPTER V

AN IDEAL SANATORIUM: A FEW HINTS AS TO ITS REQUIREMENTS

THE writer's long connection with sanatorium work has enabled him to work out some practical ideas as to the requirements of an open-air sanatorium, which he would gladly lay before the medical profession, in the hope that they may be of some use in the public cause. In pointing out some of these ideas, he has no intention of criticizing any of the existing sanatoria, which are doing excellent work, or of entering into any technical details in regard to the plan of the building or the architecture, or to the administration of a consumptive institution. His main aim is to emphasize how important it is that an open-air sanatorium should combine simplicity and economy with efficiency in its construction, equipment, and management.

The Site of a Sanatorium.—Any place in the country, except on the coast or near the sea. An undulating land is preferable to a flat country.

The Soil.—Rock, gravel, sand, or any porous soil; never clay.

Altitude.—Six hundred to eight hundred feet above sea-level.

The Grounds.—The sanatorium grounds should extend about fifty to a hundred acres in extent, and should not be nearer than three miles to a railway-station or a town. The sanatorium should stand on a slope, rising at the back, and be wooded with pine and fir trees to afford protection from north and east winds, and overlook the

south, commanding an extensive view of the surrounding country.

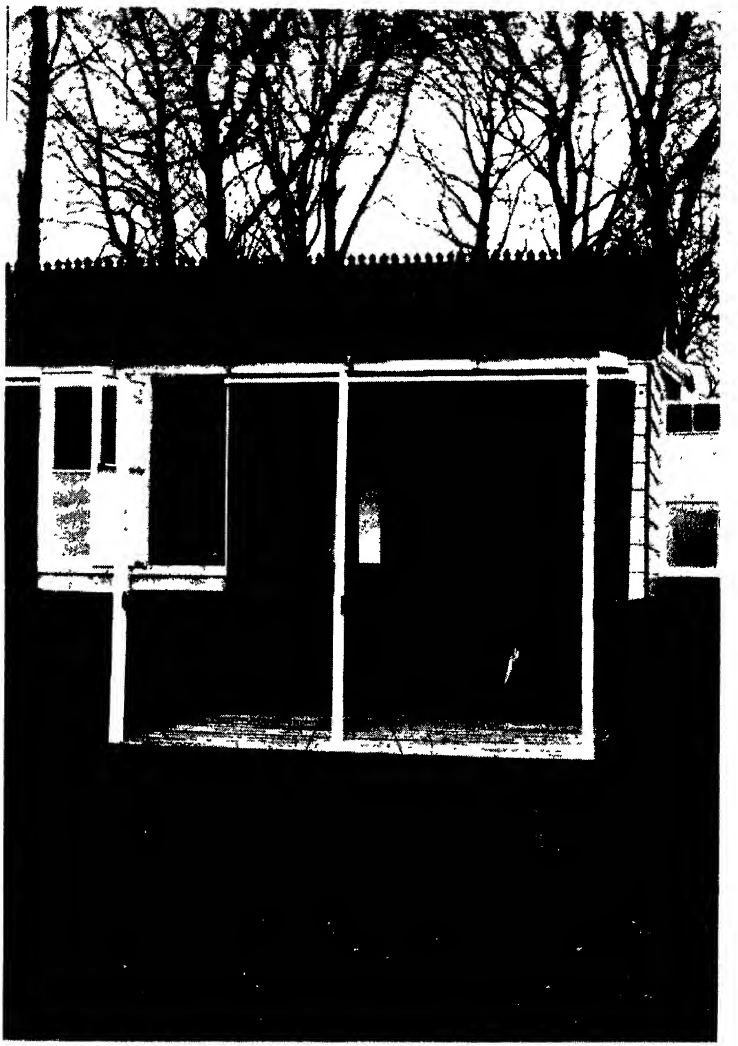
The Building.—An ideal sanatorium would be simple and inexpensive in construction and equipment. A big stone or brick building three or four stories high, after the manner of some of the foreign sanatoria, is both unnecessary and inappropriate. It is waste of money to spend thousands of pounds in putting up costly buildings. Nature is simple in her ways, and the open-air sanatorium should imitate her both in construction and in treatment. The writer speaks from experience when he says that the best sanatorium is that which consists of a number of semi-detached châlets, or sleeping-huts, separate for each patient, with an administrative block for the domestic, nursing, and medical staff. The advantages of the châlet system are that the shelters are more economical, and more comfortable to the patients; they admit of more through ventilation, so that every part of them is constantly flushed with pure air, and they are in every respect more efficient than the rooms in a brick building. The extra cost of service which the system entails is more than counterbalanced by the comparatively small initial outlay and by the better results.

The Accommodation.—A private sanatorium should not be built to contain more than twenty-four to thirty beds, and a public one not more than thirty-six to forty beds—just large enough for a physician and an assistant to work with ease and comfort. If more accommodation is found to be necessary, the châlet system is so elastic that one or two additional huts could be added on each side of the wing. But it is a mistake to build a large sanatorium on the barrack system to accommodate eighty to one hundred patients in one building. The patient in a big institution is lost in the crowd, and is one among so many. Just as the old idea of big orphanages with large dormitories and dining-halls is giving place to the separate cottage system, so the profession will come to see that a small sanatorium is to the advantage of both the patients and the physician, for many reasons. (*a*) The châlet system, which is admitted

on all sides to make an ideal sanatorium, is only possible if it is to accommodate a small number of patients. (*b*) The patient will feel more at home in a small sanatorium; his individuality will not be lost; he will take more interest in his surroundings. (*c*) He will receive that individual attention which is so essential in the cure of pulmonary tuberculosis. (*d*) The physician will have more time and opportunity to come into personal contact with each patient, and learn his idiosyncrasies and temperament, and thus be better able to deal with each case, and obtain better results. (*e*) There is a tendency in big institutions for patients to forget those little self-sacrifices and amenities which make up life, and to give vent to small selfish acts, thinking, because there are so many, their conduct will be lost sight of in the crowd; whereas in a small sanatorium each patient has his place as in a family, where, while wrong tendencies are silently criticized, little acts of self-denial evoke kindly feeling, and create a bond of sympathy which goes to broaden life and strengthen character. (*f*) A big sanatorium means a big committee to manage it, and the tendency of large committees or syndicates is to interfere with the medical management, cool down the enthusiasm of the physician, and curtail his independence. No sanatorium can be worked with efficiency unless the chief physician has perfect independence in the control and the management of the patients under his charge. Every sanatorium that has made its name owes its success to the genius of one man.

The Construction of Châlets.—Taking the châlet system as a model, the shelters would be built of wood and stand on the ground floor, raised about 2 feet above the ground on blocks of stanchions, or on a brick foundation, so that a free current of air might ventilate underneath the floors, and keep them dry from rot and damp. The châlets would be arranged in the form of a crescent, with a central block and a wing on each side, the right wing facing south-south-east, the left wing south-south-west, and the central facing due south. The shelters of each block would be built two

PLATE VI.



A MODEL SLEEPING CHÂLET (SHOWING THE VERANDA AND VENETIAN SHUTTERS) AS USED AT THE MENDIP HILLS SANATORIUM.

To face page 132.

by two, with an interval of 6 to 8 feet between, so that each châlet might be open on three sides. They would have a common corridor, about 4 to 5 feet wide, running at the back. The floor-space of each shelter would be 10 by 12 feet, 11 feet high at the roof, and 8 at the eaves of the shelters, and 6 feet 10 inches at the eaves of the corridors. If the floor of the corridor were dropped 7 inches from the level of the shelters, it would give the corridor a roof-fall of 1 foot 9 inches. On the south aspect each châlet should have two French windows opening from the floor to the ceiling, and each window divided into two parts, so that each part could be open or shut independently of the other; the top part measuring 2 feet by 5 feet 6 inches, the lower part 2 feet by 2 feet 6 inches. The French windows would open out into a veranda 6 by 8 feet, and be flush with the floor of the bedroom, so that the bed might be wheeled right out. Outside, the French windows would have two sliding Venetian shutters, each measuring 2 by 8 feet, which would give protection from the driving rain and the rays of the sun, and also insure privacy without closing the windows. On the north aspect would be a door measuring 2 feet 6 inches by 6 feet 6 inches, and above the door hung a fanlight, 1 foot 6 inches by 2 feet 6 inches. On one of the sides of the châlet, north or south, as the case might be, there would be two windows, each measuring 1 foot 9 inches by 4 feet, the lower one glazed with ground glass, and above the windows a fanlight, 2 feet by 3 feet 6 inches. And from the back of the middle of the central block a corridor would run leading to the recreation, dining rooms, and kitchen on the one side, and quarters for the physicians, the matron, and nurses on the other. If more accommodation for the staff were found necessary, it could be provided for by erecting another floor.

Lavatory Arrangement.—For a small sanatorium, earth-closets are preferable to water-closets.

Furnishing.—Each châlet would be provided with a combined chest of drawers and dressing-table; a cupboard, built in; a small chair and a cane lounge-chair with an adjustable

back; a bedstead, 6 feet 6 inches by 2 feet 9 inches; a small table—all painted white. A wash-hand basin, fitted up with hot and cold water, a radiator, a piece of carpet or matting, would complete the furniture.

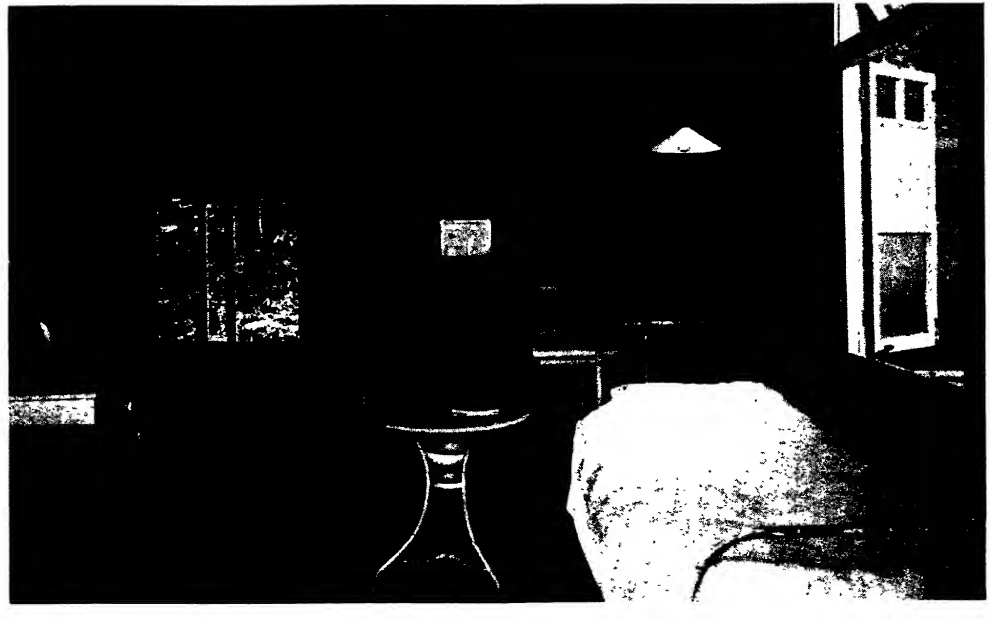
Lighting and Warming.—Lighting would be best by means of electricity generated on the site, and warming by means of hot-water pipes and radiators.

The Medical Staff.—The staff would consist of a chief physician and an assistant who would also be a bacteriologist, a matron and nurses, all healthy and strong, and having no taint of consumption. All the members of the staff should have been trained to the open-air work. The matron and nurses should be bright and cheerful, so that their healthy looks and smiles might have a healing influence on the patients.

The Chief Physician.—A sanatorium centres itself round the personality of its chief. The parent Nordrach will ever be associated with the name of Walther, Falkenstein with Dettweiler, and the Adirondack Sanatorium with Tradeau. The selection of a chief physician is more important than the selection of a site for a sanatorium. An efficient sanatorium does not mean a well-equipped place; for a plain building and the right man will achieve better results than a well-appointed institution and an inefficient head. A ship may be very beautiful to look at; it may be fitted up with modern and improved machinery, and furnished with every imaginable luxury; but it will remain as a useless thing unless it has a worthy commander to guide its destiny. The chief physician should be married, above thirty years of age, with a commanding personality; an astute psychologist, an expert physician, a man of many parts, with eternal patience and great sympathy, full of enthusiasm which constantly finds new channels and methods wherewith to improve the patient's condition; ever watchful, full of hope and confidence in himself and in the plan of campaign he has undertaken.

Main Objects of Treatment.—The aims of an ideal sanatorium would be—

PLATE VII.



INTERIOR OF A SLEEPING CHÂLET.

To face page 134.

(*a*) To treat the patient by appealing to all sides of his nature.

(*b*) To steer clear between the rocks of too much liberty and too much discipline.

(*c*) To prevent the patient's mind from constantly dwelling upon himself and upon his disease, by keeping his mind occupied with a variety of interests.

(*d*) To permeate the sanatorium with an atmosphere of homeliness and cheerfulness, that health may be constantly suggested to the subconscious mind by pleasant surroundings.

(*e*) To work out the patient's physical salvation by a variety of exercise and manual work.

(*a*) Man is many-sided and presents many aspects. If disease be the outcome of disorder of the various elements of man, harmony and healing can only be brought about by studying each patient individually, and by bringing the right adjustment to bear on the physical, mental, moral, and spiritual sides of his life. Healing is not achieved by appealing merely to the physical part of man alone. One or two instances have been given before (see p. 37) where we see that there are higher forces and powers which control and influence the body for good. A patient, a mother of many children, ill in bed, began to improve from the time she saw a child with a merry face. She saw in the child a likeness to one of her own children, and the recollection of her dear ones at home gave a new impetus to her resolve to get well for their sakes; and this resolve set to work influences which helped her recovery. A lady teacher, after a long struggle with tuberculosis, began to mend. But the daily routine for many months in the sanatorium began to tell upon her nervous system, and she could neither eat nor sleep. She was given some congenial work to do which engaged her interest, and her interest grew as she realized that she was rendering some real service which was appreciated. That work was her salvation; it saved her from a nervous breakdown, and helped her to conquer the disease.

The sanatorium could be made an educational centre as

well as a place of healing. Besides gardening, painting, etc., small classes could be formed, when such subjects as botany, physiology, hygiene, shorthand, etc., could be taught for about twenty minutes to half an hour. If plenty of means were available, teachers on special subjects could be invited to deliver short lectures on history, astronomy, geology, literature, etc. By thus engaging the mental faculties we divert the patient's attention from his disease and open up new channels of interest, all of which, no doubt, help to put him on the way to recovery.

(*b*) This brings us to the consideration of another aim of the sanatorium, viz., that we should not bind ourselves to set rules and regulations, and make them our master instead of our servant. Rules and discipline there must be in a public place like a sanatorium, where we have to deal with a large number of people with different temperaments and character. But the wisdom of the physician would aim at regular irregularity, at sympathetic discipline, at a judicious relaxing of the rules. For instance, one of the sanatorium rules is that when there is temperature a patient does not take exercise. But this rule should not be rigidly adhered to in all cases. I have seen cases over and over again when the patient's temperature came down, and kept down, after he began to take a little exercise and to take an interest in his surroundings. There are many unseen influences that play round man which control his life and health; we are apt to see only the mechanical, the material side of life, and forget those invisible forces.

So in the manner of diet. The writer, when he commenced the sanatorium treatment, was so exact that he weighed the food for each patient at each meal, so that it could be reckoned how much each patient had during the course of the day or week. But he has seen the mistake of such a procedure. A man's strength is not in proportion to the number of ounces of food he eats. The stomach controls the food, the nervous system controls the stomach, and higher influences preside over the nervous system. A happy state of mind, a pleasant environment, cheerful companionship,

have more to do with restoration of health than the amount of rich food taken into the stomach. The ideal sanatorium, recognizing all this, does not insist that a certain quantity of food or milk should be daily taken by each patient, but gives him a certain amount of liberty in the matter of eating and drinking. So, in things pertaining to the daily life of the patient, it is wise not to bind him to set methods and means, but to see that the methods and means suit each patient according to his condition and temperament.

(*c*) and (*d*) Another important aim of the ideal sanatorium should be to divert the patient's mind from brooding upon his condition by making his surroundings pleasant and congenial. The whole atmosphere of the sanatorium should be such that the patient will not look upon himself as an outcast, or as a chronic invalid who will no more return to the busy world and take part in its affairs; but in many ways it should be repeatedly impressed upon him that the sanatorium is only a temporary sojourn, that he will go back with renewed health and strength to join the family circle and society, and that he has work to do as a member of his family, and as a citizen of a great State. The hopeful encouragement of the physician; the bright faces of the nurses and the matron; the pleasant companionship of the senior patients, whose ruddy cheeks and returned health speak loudly of the benefits of the sanatorium, together with the calm and restful surroundings, should be made to suggest cheerfulness and health to the subconscious mind of the patient, and prepare the way to the good effect of the food and all the rest of the sanatorium treatment. No one with a sour face or unsound health should be employed in the sanatorium.

The women patients generally exert a good influence upon the men patients. An editor of an influential London medical paper wrote in one of his leading articles that flirtation was one of the dangers of the sanatorium. I do not know where he got his idea from. I have been ten years in connection with sanatorium work, and have watched hundreds of patients, and have seen some innocent flirtation which died a natural

death when the parties separated, but I have never seen it take a dangerous character, except in one case, and that was of a medical man. On the other hand, I have seen the gentle influence of women do a great deal of good in refining the men patients, and in bringing out the latent good and elevating their ideals. True, the sanatorium is not a barracks for soldiers, or a monastery for saintly people. It is a human institution, filled with men and women with human feelings and sympathies. Wise is the physician who, understanding human nature, will allow those feelings and interests some free play, and make them serve the good purpose of getting his patients well.

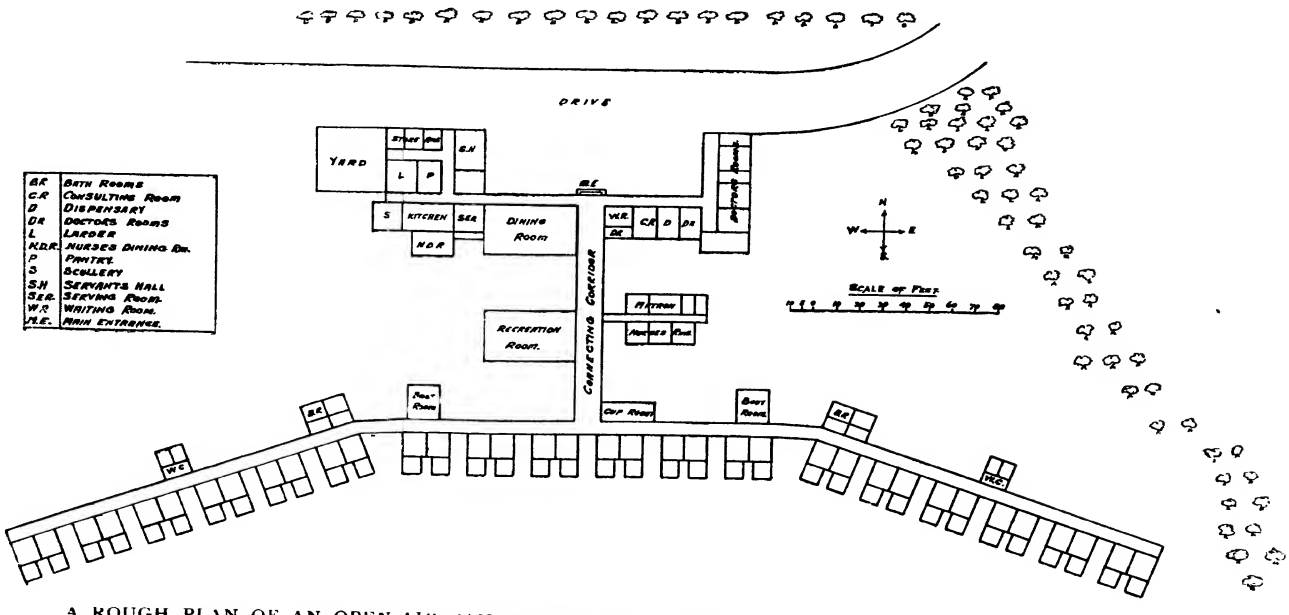
(*e*) The ideal sanatorium would see that the patient works out his salvation by exercise and manual work. The patient, during the earlier period of his stay in the sanatorium, is put on to different exercises, which are gradually increased till, in the later period, he grows accustomed to do hard manual work. It does not matter if his temperature goes up. The rise of temperature as he is improving is often due to the healthy reaction caused by muscular exercise. The patient's life in the sanatorium can be roughly divided into three periods:

First Period.—During the first two or three months the patient gives himself up to carry out strictly the daily programme as it is made out for him. The temperature and the pulse are regularly taken, and the state of his health and progress carefully watched. He takes much rest, and replenishes his stores of vital energy and resistance.

Second Period.—He has put on weight, and feels his strength gradually returning. The temperature, which was perhaps above normal in the first period, has come down. He goes for longer walks, and takes part in most of the exercises, and commences to do manual work.

Third Period.—First part: He is still improving. The temperature is normal. He does full justice to all the exercises and manual work. The temperature and the pulse need not be taken so regularly, and the physician visits him only once a day. He goes into camp life.

PLATE VIII.



A ROUGH PLAN OF AN OPEN AIR SANATORIUM FOR THIRTY-SIX PATIENTS ON THE CHÂLET SYSTEM.

To face page 138.

Second part: The disease is nearly arrested. The physician need not visit him every day. The temperature is only taken occasionally, and the chart is taken away from him. He tramps many miles a day. Every sanatorium should have for senior patients an annexe or a cottage, with about six bedrooms—three on the ground-floor and three on the first-floor—and a common sitting-room. Here the senior patients could spend together, as in a family, the last few weeks of their stay, joining with other patients at meal-times. They are allowed a great deal of liberty, and while under medical supervision they try to live an ordinary life, and prepare themselves for going home. They help and encourage the junior patients by their presence and example, and lead them in all the exercises. Some of these exercises could be made interesting in a variety of ways. For instance, a small cottage might be rented, or a lock-up shelter erected, about five to eight miles from the sanatorium, and senior patients could walk to the cottage, take their lunch with them, and rest, and walk back in the evening for supper; or stay a night at the cottage, and make it a central place for a tour round the neighbourhood, and return the next day. Two or three such places could be put up in different parts, within easy distance of the sanatorium, which would thus have an extended sphere of usefulness. Again, a camp might be erected in some part of the estate, or not far from it, where two or three patients could go and live the open-air life. They could cook their own breakfast, and come back to the sanatorium for the rest of the meals; or tea could be arranged for all the patients at the camp. If means were available, the camp life could be extended in a caravan, which could be built on open-air lines, and furnished with movable beds, kitchen utensils, etc. Patients could go farther afield, walking about ten miles a day, and resting during the night in the open air, or in the caravan if the weather were unfavourable. After spending a week in this fashion, they could return to the sanatorium to make room for another batch of patients.

I have seen disastrous effects from keeping the patients too

long under the strict sanatorium régime. The daily well-known walks; the sight of the familiar faces and things; the constant visit of the physician and the nurse; the perpetual taking of temperature and pulse, and marking them on the chart, which stares at the patient as a recording angel of all his bad deeds—all these make his life monotonous, and keep the disease constantly before his mind, and get on his nerves. And a mental state like this is not conducive to bringing about the recovery of the patient. Therefore, for those whose progress is not rapid or satisfactory, or in whom the disease has taken a chronic course, there should be, in connection with every sanatorium, a branch establishment, or a cottage, preferably near the seaside, where these patients could be sent for a complete change for two or three weeks. They would be all the better for such a change of scene and surroundings, and return to the sanatorium with renewed eagerness to continue the treatment. Besides, with one or two changes like this, the moderately advanced cases could be kept under treatment for a sufficiently long time to bring about an arrest of the disease.

In mapping out and arranging the patient's life in some such way, greater variety would be given, the patient saved from dull monotony, his interest kept up to the last, and his life made pleasant and enjoyable, and at the same time the prospect of his recovery be more assured.

In our sanatorium we have attempted to carry out in a humble way many of the suggestions and schemes put forward in this chapter, and it is because our attempt has met with success that we have ventured to bring these ideas before the public, in the hope that they may have a larger scope, and be put into practice on a wider scale.

CHAPTER VI

HÆMOPTYSIS

Of late years profuse hæmoptysis, threatening the life of the patient, is not so common in sanatorium experience. It may be because the patients are taken in hand earlier, and the sanatorium treatment tends to build up their strength, quicken the healing process of the lung, and arrest the disease before any serious erosion of a bloodvessel takes place. In fact, the treatment on open-air lines has more or less completely modified many of the classical symptoms of consumption, such as hæmoptysis, night-sweat, pyrexia, etc. Excepting where the hæmoptysis occurs from the rupture of an aneurism or of an arterial vessel during the last stages of tuberculosis (of course, I exclude all those hæmorrhages caused by mitral disease, aortic aneurism, tumours, hæmophilia, etc.), the majority of cases that are seen in a sanatorium are amenable to treatment, and need not cause serious alarm. When hæmoptysis occurs during the early periods of the first stage, and the physical signs are practically nil, it is due to the congestion of the lung causing hyperæmia, which is Nature's way of combating the disease and effecting a cure. The organism at this stage is very sensitive, and the presence of the enemy is followed by an increased supply of blood to the affected part, and hæmoptysis, when it occurs, acts like an overflow to the congested vessels. The blood that has escaped into the tissues has a bactericidal action, and tends to engulf the microbes and destroy them. This is why so many early cases of hæmoptysis do well and recover. Besides, the

hæmorrhage so alarms the patient that he immediately seeks medical advice, which otherwise he would not do, and goes for a change, or undertakes a course of sanatorium treatment. Thus many a life is saved by the timely warning of Nature.

Often these early cases of hæmoptysis present little or no physical signs, and no cough, expectoration, or temperature. Even a slight impaired movement, or one or two clicks in one of the apices, may be absent, and the physician is apt to make slight of such cases, and attribute the source of hæmorrhage to the nose or throat. Of course, a varicose vein at the back of the pharynx is a probable though a remote contingency (the writer has had only one such case), and the diagnosis becomes extremely difficult when hæmoptysis is accompanied by indefinite and almost all negative symptoms. But the writer's experience makes him say that it would be wise for the physician to treat all such cases (after excluding all other possible source of bleeding) with suspicion, and give the patient the benefit of the doubt, and send him away for a change or for immediate treatment for a few weeks. By this course he will free his conscience from all future blame or responsibility, and at the same time help the patient to renew his health and strength. Sometimes, before or during sanatorium treatment, the morning sputum is stained from spongy or bleeding gums, or from a congested throat when the patient begins to cough and expectorate, and should not be confounded with hæmorrhage from the lungs. At other times the patient persists in bringing up a little blood, or the sputum is stained for several days, especially in the morning. This may be due to healthy inflammatory reaction or be a sign of a healing lung, which, like a granulating wound, is well supplied with blood, and inclined to bleed from simple hyperæmia. In some of the sanatorium patients who respond to the treatment quickly, and who, by doing full justice to the diet, make blood rapidly, the hæmoptysis need not cause much alarm. Their full-blooded and plethoric condition is brought about by high feeding,

and the hæmorrhage is more beneficial than otherwise, as it acts like a safety-valve to the congested vessels. Such cases do well when the diet is restricted and the quantity of milk is reduced to a half or one glass a day, and the patient is put gradually on to more exercise when the bleeding has stopped. The writer has noticed cases of hæmoptysis occurring in some women patients during their menstrual periods, when a kind of tide flows over the whole body, including the lungs. This tide may increase the blood-pressure for the time being, and may find out a weakness in a bloodvessel, causing hæmorrhage. The writer had a patient who for several months had attacks of hæmoptysis at the time of her monthly periods, and sometimes replacing them. It is possible for the hæmorrhage, or vicarious menstruation, as it is called, to occur without any lesion in the lungs, but should there be a weak spot in the pulmonary organs, it is more likely to show itself there.

Treatment.—An attack of hæmoptysis generally terrifies the patient, and the physician, to allay his fear and distress of mind, is tempted to step in and stop the hæmorrhage in all cases. But he should bear in mind that in so doing he may be interfering unnecessarily, and thus working contrary to Nature's purpose. Hæmoptysis may be due to increased blood-pressure or to the erosion of a bloodvessel, or to both, the increased pressure causing a rupture of a vessel already weakened by tuberculous disease. Small hæmorrhages may be useful, and be a blessing in disguise. It may be Nature's way of relieving undue tension in the systemic arteries. Hæmoptysis will be found beneficial in two ways: (*a*) It reduces the blood-pressure, thus arresting hæmorrhage; (*b*) the effusion of the blood in the lung may be used by Nature as a means of bringing about the arrest of the disease by causing inflammatory reaction and formation of fibrous tissue. Therefore the sanatorium experience gives the physician a certain amount of boldness and freedom in the treatment of hæmoptysis. While he keeps a watchful care over such cases, he is not unduly alarmed, nor does he seek to stop every attack with hæmostatics. In some

cases a recumbent position seems to be most advantageous; in others a reclining attitude seems to be most beneficial; while in some others a more or less upright position helps to get rid of the blood-clots. The best position seems to be that which is most comfortable to the patient, and most easy for the removal of clots, and least prone to dyspnœa. In a great many cases the prognosis is generally favourable. If the hæmorrhage is small, and the patient's strength is good, rest in bed and a low diet may be all that is necessary. If the hæmorrhage is persistent and troublesome, absolute rest in bed and quiet is enjoined, the patient being kept free from all excitement, and his strength maintained with low but nutritious diet. In serious cases of hæmoptysis followed by fever and exhaustion the patient should be fed day and night, and the diet made as nutritious as possible with milk, raw eggs, etc.

Drugs.—In the writer's experience there are only two remedies that are both safe and reliable in hæmoptysis—*i.e.*, morphia and nitrite of amyl. Even morphia should not be given indiscriminately or as a routine practice, as it tends to lower the sensibility of the bronchial and alveolar walls and favour broncho-pneumonia. If the cough is troublesome and irritating, and the patient is in a restless and agitated state of mind, a hypodermic injection of $\frac{1}{4}$ grain of morphia lowers the blood-pressure, quiets the action of the heart, and allays the patient's fears. If the tension of the blood is great in spite of the bleeding, and hæmoptysis is profuse, nitrite of amyl in 3 to 5 minim capsules, inhaled, acts very beneficially, and stops the hæmorrhage in many cases. But it should be used with care, and tried only after morphia has failed to control the hæmorrhage. The writer has found no help in drugs like chloride of calcium, ergot, adrenaline, etc. The administration of ice, either internally or externally, is of no use, and should be discarded.

CHAPTER VII

THE TREATMENT OF LARYNGEAL TUBERCULOSIS

LARYNGEAL infection is generally secondary to pulmonary tuberculosis. It is an extension of the disease from one or both the apices of the lungs. It affects more than others those who employ their voice in their daily vocation, as teachers, singers, etc. Laryngeal tuberculosis is a terrible and distressing complication. Few can realize the state of mind of the patient when he is told that the fell disease has crept up and has taken a grip of his throat. The steady and silent progress of the disease from the lungs, the hoarseness culminating in complete loss of voice, together with the increasing pain and difficulty of swallowing, add to the suffering of the consumptive patient, making his condition truly pitiable. But now the sanatorium treatment has brought a bright ray of hope to the unhappy sufferer. The encouraging results of silence treatment in this disease have greatly added to the credit of the open-air sanatorium, where alone rest to the voice can be systematically applied with success. Our experience of the treatment by vocal rest has been so satisfactory that we are convinced that if the disease is early taken in hand, the majority of cases will get well. Tuberculosis of the larynx is more common than was once supposed. About 18 to 20 per cent. of the patients that have entered our sanatorium had laryngeal complication. It is as slow and insidious a disease as its parent, tuberculosis of the lungs. Patients have used their voice in singing, teaching, etc., and have not suspected until long after the

implication of the vocal cords. During the last seven years we have been treating laryngeal cases on certain definite lines, the principles of which will be briefly described. The treatment is divided into general and local, and local treatment is based upon two essentials—rest to the voice and formalin inhalations.

General Treatment.—It should be borne in mind that laryngeal tuberculosis is only a local manifestation of the disease of the lungs, and when the patient comes under treatment he is very often run down in health, with his nervous system more or less impaired. Therefore local remedies alone will not be sufficient to bring about the arrest of the disease; he should be placed under the best possible hygienic conditions, and his general health and nutrition improved by sanatorium treatment. So all patients with laryngeal trouble go through the various items of sanatorium régime with slight modifications, as described in the second chapter. They spend a great part of the day in the open air, which has a soothing and healing influence over the throat. They carry out the various exercises, except singing, and take their rest like other patients. If the temperature goes up, they rest in bed, which in fine weather is wheeled out on the veranda, and kept there day and night.

Rest.—The open-air movement has not only revolutionized the treatment of pulmonary tuberculosis, but also of its laryngeal complication. Until recently, besides local medication, the surgeon's aid was very commonly resorted to. But now, thanks to the sanatorium movement, we have learnt the value of rest and early treatment of the larynx, and have found that the less the surgeon interferes, the better for the patient. In early cases operative treatment is not necessary, and in the late stages, when ulceration and fixation of the cords leads on to more or less complete dysphagia, it can at most only be palliative, and may increase the suffering of the patient, and perhaps hasten his end. It is to be hoped that in the coming years the physician will be able to detect the disease in its early stages, and thus do away with any necessity for scraping, curetting, or any other surgical opera-

tion. The secret of success in laryngeal disease lies in two things—in commencing treatment as early as possible, and in obtaining more or less complete rest to the voice. When a part of the body is injured, Nature enjoins rest, and it has taken all these years for man to find out this elementary lesson and apply it to this painful disease. The more thoroughly the patient helps the physician in keeping silence, the more complete will be the success. The patient will experience a certain amount of hardship and inconvenience in carrying out the strict silence, but the constant encouragement of the physician, together with the improvement in himself and in other patients, will inspire him with hope, and will make it easier for him to persevere in the treatment.

Treatment in the Different Stages.—In our sanatorium, laryngeal cases are roughly divided into four degrees or stages.

First Degree.—Here the patient, besides showing signs of disease in the lungs, presents a slight laryngeal catarrh; the voice is hoarse and weak, there is a tickling sensation in the throat, a sense of fatigue after using the voice in singing or speaking. Under the silence treatment a great majority of these cases get well. The patient is prescribed a complete rest to the voice for two or three weeks, and as the hoarseness begins to clear he is allowed to whisper. According to his temperature he takes part in the general sanatorium treatment, but in silence. He wears the oro-nasal inhaler, devised by the writer, for an hour or so a day, more as a precaution to prevent any further spread of mischief in the larynx. He takes the ordinary diet. We have seen case after case at this stage get well.

Second Degree.—Here laryngitis is pronounced. The tubercular disease is confined to the vocal cords, which are congested and reddened; there is pain in the larynx, hoarseness, slight difficulty in swallowing; besides, the patient has well-marked disease in one or both the apices of the lungs. The temperature goes up, the appetite is fair, and the digestion good. Here also the prognosis is very good. The patient is put under absolute silence treatment for a few weeks, and

is allowed to communicate with the others either by signs or by notebook and pencil. He goes to bed early if the temperature is inclined to go up in the afternoon, or is in bed the whole day if the temperature is above normal in the morning. The temperature should not always be taken as a guide in keeping the patient in bed, as other causes than the diseased condition may make it go up. As soon as the voice improves, and the hoarseness ceases, he is allowed to whisper, and as he improves he takes part in the various items of the sanatorium programme in silence. He has the ordinary diet, except that he is not allowed to eat anything hard like bread-crust, or anything hot or pungent. He uses the oro-nasal inhaler for two or three hours, and then the vaporizer, both of which will be presently described.

In the *Third Degree* are included cases where there is ulceration of the vocal cords, œdema, swelling of arytenoids, loss of voice, and pain in swallowing. Here very likely there is more or less extensive disease of one or both lungs; but sometimes it is not so, as the infection spreads upwards into the throat rather than downwards into the lungs. The temperature goes up, the pulse is rapid, the appetite bad. The patient is in poor health, and his sleep is much disturbed by cough and expectoration. In this case he is kept under strict silence treatment; he is not allowed to see anyone, but is kept in bed very quiet; all smoking is prohibited, and even the smell of smoke, or anything that would irritate the throat, is avoided. The food is given in semi-solid form, more or less cold, as patients manage to take cold food better than hot; all condiments, sauces, spicy dishes, or anything that would give pain, are prohibited. As the fever subsides, and the condition of the throat improves, he is allowed to sit up, communicate with others by notebook and pencil, or by dumb signs. As the temperature improves he is permitted to take outdoor exercise, which is gradually increased. He wears the inhaler, first for one hour, and then the time is slowly increased to four, five hours a day, or even longer if necessary; in fact, as soon as he wakes up in the morning he wears the 'muzzle,' and keeps it on as he reads,

writes, or goes for his daily walks, etc. As the voice loses its hoarseness, and the ulcers of the cords begin to heal, he gets on to the vaporizer. By this time the voice comes back, and he begins to speak, and gradually to take part in the singing exercise. And finally the tone of the voice is helped and improved by the application of static electricity.

One of these cases of the third degree was recently treated with Kuhn's Suction Mask[1] with great success. The mask is made on the principle, advocated by Professor Bier, of treating diseased parts by inducing artificial

FIG. 5.—MUTHU-KUHN'S MASK.

hyperæmia. The patient, a School Board teacher, single, and thirty-five years of age, presented well-marked symptoms

[1] The apparatus consists of a light celluloid mask fitting over the nose and mouth, divided by a cross partition into two chambers, for the nose and mouth respectively. It is so devised that by an adjustable slit in the nose-chamber a graduated resistance to inspiration is produced, bringing about a negative pressure in the thorax, and inducing a certain amount of hyperæmia in the air-passages and the lungs. The author has slightly modified the mask by introducing a perforated inset into the nose-chamber, whereby the inspired air can be impregnated with formalin and other volatile vapours, to do the double duty of a suction mask and inhaler.

of laryngeal and pulmonary tuberculosis, such as loss of voice, pain and difficulty of swallowing, pyrexia ranging from 99° to 100° F. in the evening, cough and expectoration, emaciation, etc. The mask was worn for fifteen minutes morning and evening at first, and afterwards the time was increased to thirty and forty-five minutes twice a day, followed by the use of the formaldehyde inhaler for two or three hours daily. After four months the mask was worn alternately with the inhaler. At the end of seven months the temperature became normal, cough and expectoration ceased, the voice came back, and the disease was arrested.

In the *Fourth Degree* the ulceration of the cords spreads to the arytenoids; there is a great deal of infiltration, which extends to the aryepiglottic folds, ventricular bands, etc. There is complete loss of voice, great pain and difficulty in swallowing, and extensive disease of the lungs, high temperature, and rapid pulse. Here the strict silence treatment carried out in the open air improves the patient's condition, but grave constitutional symptoms—loss of strength, and the difficulty of feeding—handicap the efforts of the physician, and render the prognosis bad. The employment of orthoform as an insufflation relieves the pain, the inhalation modifies the cough, and the sedative vapour enables the patient to swallow with comfort.

Medicinal Treatment. Externally, Lint. Iod. painted over the larynx about once or twice a week is of great benefit in subduing inflammation and catarrhal swelling of the throat.

Internally, remedies are applied either through the oro-nasal inhaler or the vaporizer. The writer has been using an inhaler ever since 1899, and had the privilege of pointing out the importance of formalin in the treatment of pulmonary and laryngeal tuberculosis in a paper read at the Tuberculosis Congress held in London in 1901, and ever since he has used it in laryngeal tuberculosis with great benefit. The author's formaldehyde inhaler is pyramidal in shape, flexible and light, and made of perforated zinc. It is somewhat similar in shape to that of Dr. Yeo, but differs in being

larger, fuller, and nickel-plated. It is curved to fit the chin, and has leaden clasps to take in a layer of cotton-wool.

The following are the advantages of formalin :

1. Formalin is a strong germicide, and the inhaler is a convenient mode of introducing it to the parts affected by tuberculosis.

2. In the early stages it is used to prevent any spread of infection to other parts of the larynx.

3. The inhalation is very beneficial in pulmonary as well as in laryngeal tuberculosis.

4. With chloroform it allays and modifies cough and irritation in the throat.

5. The patient can use it at all times—in the open air, while reading, or walking, or resting.

6. The inhaler keeps out the dust and adds a certain amount of moisture, both of which conditions are necessary in laryngeal tuberculosis.

7. The patient can keep up the inhalation treatment at home or anywhere after he leaves the sanatorium.

The Inhalant Mixture.—To begin with, formalin is used in 2½ per cent. strength, as in the following formula :

℞	Formalin (40 per cent.)	♏xv.
	Chloroform	ʒss.
	Menthol	gr. v.
	Ol. pini	♏v.
	Spt. vin. rect.	ad ʒiv.

Ten drops to be sprinkled about every half an hour.

And the strength can be increased to 5 or even 10 per cent. if necessary.

The Vaporizer.—The vaporizer is another pleasant and effective way of introducing formalin into the larynx. After many trials with different atomizers, sprays, etc., the writer has found a simple and efficacious apparatus in Oppenheimer's Universal Vaporizer. It has the great advantage of converting medicated solutions into a fine vapour, which readily enters with the inspired air into all parts of the larynx and air cells of the lungs. By this instrument the particles of vapour fall on the diseased surface as softly as

smoke, without causing any irritation or injury. When formalin is combined with other antiseptic fluids, the vapour can be used as a sedative, analgesic, or as a stimulant, and thus a wide range of remedies can be applied to meet many conditions of laryngeal disease.

The following formula is generally used in the sanatorium:

℞ Formalin (40 per cent.)	ʒss.
Chloroform	ʒss.
Spt. vin. rect.	ʒii.
Neboline compound, No. 1 (Oppenheimer's) ...	ad ʒi.

As a sedative in cases of ulceration and pain the following is used:

℞ Formalin (40 per cent.)	♏xv.
Menthol	gr. viii.
Acid. carbol.	♏viii.
Chloral hyd.	gr. viii.
Terebene	♏xv.
Neboline compound, No. 1 (Oppenheimer's) ...	ad ʒi.

In conclusion, the earlier the treatment is begun, the more sure and satisfactory will be the result. The silence treatment alone can do wonders in laryngeal disease, and should be the basis of all further treatment. The suction mask will be found beneficial by producing local hyperæmia and increasing the richness of the blood, which has a distinct bactericidal action. The inhalation treatment by the inhaler and the vaporizer, though it very probably has no specific effect on the tubercle bacillus, helps to bring about recovery by checking the spread of the disease to healthy parts, and by preventing mixed infection by pyogenic organisms.

CHAPTER VIII

THE FORMALDEHYDE TREATMENT

THE idea that volatile substances inhaled into the lung have a beneficial effect on consumption is as old as the ancient Greeks. Even before the time of the Greeks, we read in the classical work of Charaka—an ancient Hindu physician, who lived in the pre-Buddhistic era—that different spices, gum-resins, and fragrant wood, were ground into powder, made into a paste, smeared over thin tubes and lighted, and the smoke was inhaled in diseases of the throat and the chest. Galen praised the efficacy of sulphur, and advised his consumptive patients to go and live near Vesuvius, so that they could breathe the air charged with sulphur. Laennec, the inventor of the stethoscope, in his great work, 'Auscultation Mediate et des Maladies des Poumons et du Coeur,' makes mention of the inhalation of vapours from aromatic plants, balsams, myrrh, sulphur, etc., in the affections of the chest. The discovery of micro-organisms as the exciting cause of disease gave a new impetus to the inhalation treatment, and brought into the field many forms of apparatus, in which various volatile substances were tried for inhalation purposes. But owing to the inefficacy of many of the sprays and inhalers, which failed to reach further down than the nose or the upper part of the throat, the inhalation treatment fell into disfavour among the profession. However, the success achieved in some clinical cases, together with the invention of more efficient methods, and a better knowledge of the drugs and their action, have once more revived this mode of treatment in pulmonary disease. Ever since Koch's dis-

covery, many antiseptics and disinfectants have been brought into prominence with the object of destroying or checking the growth of micro-organisms. One of the latest of these is formic aldehyde. Some years ago the writer made a series of trials with formaldehyde. A course of experiments he undertook in the disinfection of rooms called his attention to the strong germicidal properties of the drug,[1] and ever since he has applied it in the treatment of laryngeal and pulmonary tuberculosis.

Formic aldehyde or formaldehyde (H.CHO), a gas obtained by passing methyl alcohol over platinum—a molecule of methyl alcohol ($CH_3.OH$) passing over platinum loses two atoms of hydrogen, which, combining with oxygen, forms water, leaving behind formic aldehyde (H.CHO)—has of recent years come rapidly to the front as possessing powerful antiseptic properties and therapeutic value. It is gradually superseding some of the older antiseptics, having some distinct advantages over them. It is non-poisonous and non-corrosive, can be used in the form of solution and gas, easy and clean in its application, and does not discolour textile fabrics, leather goods, household articles or metals, except iron and steel. It is extensively used in surgery and gynæcology, in ophthalmic practice, and various skin diseases—in fact, wherever a strong germicide is needed.

So wide is the interest taken in formaldehyde that medical men from almost every part of the world are making extensive trials to introduce it into the system in some form or other in cases of laryngeal and pulmonary tuberculosis. For instance, Professor Cervello, of Palermo, has been working for some years on this subject, and has introduced an apparatus for the inhalation of the gas. Dr. Ruata, of Perugia; Dr. Huggard, of Davos Platz; and in this country, among others, Dr. Green and Dr. Murrell, have reported successful cases treated by the inhalation of formaldehyde. Lastly, Dr. Robert Maguire, of Brompton Hospital, has introduced the intravenous injection of formalin, and since then others are trying it both in private and hospital practice.

[1] See 'Report of Tuberculosis Congress,' London, 1902, vol. iii., p. 434.

There are three ways of administering the inhalation of formaldehyde in laryngeal and pulmonary tuberculosis: by the oro-nasal inhaler, by the vaporizer, and by the lamp. The first two ways have been described in the previous chapter.

The Lamp Method. — Another method of generating formaldehyde is by a lamp vaporizer, which consists of a methylated spirit lamp and an open boiler, into the mouth of which is let a tray whose sides are covered with wire gauze. The tray carries paraform powder or tabloids, with a little menthol to neutralize the effect of the vapour. The moist products from the combustion of the spirit, acting on the powder or tabloids, cause the evolution of the gas. The generation of the steam renders the action of formaldehyde more effective and penetrating, and confines its diffusion to the room where it is generated. The patient takes the formaldehyde vapour bath in the inhalation room, or, better still, in his own bedroom from half to an hour or two daily, with doors and windows partially or wholly closed. Both the inhaler and the vaporizer can be obtained of Messrs. Oppenheimer, Son and Co., London.

ADVANTAGES OF THE LAMP.—(*a*) The patient's room and its contents are rendered aseptic by constant disinfection; (*b*) the patient's personal clothing and moustache or beard, if he wears one, is also disinfected, especially his coat and vest, to which tiny and almost invisible particles of sputum from coughing are liable to adhere, and which, on drying, are apt to reinfect the patient and be a source of danger to others. In connection with this I may point out the real danger consumptives incur by wearing moustache or beard.

The objection raised against pulmonary inhalation is that by this method antiseptic volatile substances cannot reach far enough down the lungs to be of any service in the arrest of the disease. This entirely depends upon the kind of apparatus used. This is quite true in the case of respirators, mouth-inhalers, and many of the sprays, as the inhalation produced by them cannot reach lower than the trachea. Two conditions are necessary for the inhalation to be

efficacious: (*a*) The inhaler must cover the nose; (*b*) it must be continuously worn as many hours as possible. The anatomical structure of the lung, as Ruata pointed out, lends itself peculiarly to antiseptic treatment. The examination of lungs of colliers and others engaged in dusty occupations has shown that the inhaled dust can be detected in the lung tissue. Besides, if a volatile substance like chloroform can, when inhaled, enter into the circulation, causing general anæsthesia, surely it is not unreasonable to infer that atmosphere charged with a penetrating vapour like formaldehyde does enter the alveoli of the lungs, especially when it is mixed with spirit and chloroform.

There is still another way of transfusing formaldehyde by static phoresis, which will be described in the next chapter. The initial objection to the use of formaldehyde inhalation is that it causes irritation of the eyes, nose, and throat. This is overcome by adding a little menthol to the lamp; and the mixture used in the inhaler and the spray is made pleasant by the addition of chloroform and other aromatic volatile substances. Chloroform not only acts as a vehicle, but it also soothes the cough and acts beneficially on the disease itself, as Dr. Huggard pointed out. Formaldehyde, besides its highly disinfecting properties, has a hardening action on the mucous membrane of the respiratory organs, so that, after its first irritant effect is overcome, it actually allays the irritation caused by the inflammatory condition by soothing the mucous membrane of the bronchial and alveolar walls. Its benefit is especially seen in those distressing cases of bronchial catarrh which often accompany pulmonary tuberculosis. In our experience, formaldehyde inhalation combined with the open-air treatment has produced good results in the arrest of consumption—so much so that it has taken a permanent place in the daily routine of our sanatorium. The writer, in a paper read at the annual meeting of the British Medical Association held in 1903, gave instances of successful cases treated with formalin,[1] and ever since we have experienced satisfactory results. Even

[1] *British Medical Journal*, October 24, 1903.

without the open-air treatment, when patients for many reasons were unable to be treated in a sanatorium, the formaldehyde inhalation proved of great benefit in allaying cough, checking expectoration, and lessening the fever. It is difficult to prove in what way formaldehyde acts beneficially in laryngeal and pulmonary tuberculosis. It has most probably no direct or specific action on the tubercle bacillus. But by hardening the mucous membrane it would render it less susceptible to the attack of the micro-organisms; its soothing action would stop the cough, and thus check the small particles of expectoration from being sucked in and infecting new areas of healthy tissue. It must not be forgotten that the fatal termination of pulmonary tuberculosis is not due so much to the lesion caused by the tubercle bacilli as to the secondary infection by septic organisms and their toxins. So that the result of the successful treatment of formalin can be explained by assuming that its antiseptic vapour, filling the alveolar walls, would help to check the spread of infection by pyogenic cocci, and thus give breathing-time for the human organism to recover itself and throw off the disease.

CHAPTER IX

STATIC ELECTRICITY IN THE TREATMENT OF PULMONARY TUBERCULOSIS

CURRENTS of high potential with high or low rates of frequency have of recent years opened up a new field in the treatment of disease. The medical profession as a body has not yet awakened to the possibilities that lie in this branch of therapeutics. This may be due to a great extent to the ill repute that has been brought about through its ignorant use by quacks and charlatans who have long preyed upon the credulous public. Still, we cannot disregard the coins of the realm because there are some false ones in currency. It is too late in the day to doubt the value of electric treatment—at least in some diseases. We may not clearly understand the methods of its operation, nor be able to unravel all the processes by which health is restored—electricity will, perhaps, to the end of time remain a mystery—but the more we come to know the characteristics of high-potential currents and their physiological actions on the human system, the more will they be harnessed to practical use in our everyday fight with disease.

For some years I have been successfully administering the electro-static treatment in pulmonary tuberculosis in my open-air sanatorium, and I am led to believe that one of the most important ways by which it acts beneficially in diseased conditions is by restoring the normal balance of metabolism, by regulating the blood-supply, stimulating glandular activity, and by giving tone to the nervous system.

The rationale of electric treatment in tuberculosis and in other affections is simple. It is one of the most powerful natural forces we have at command in fighting disease. It is as natural a force as fresh air and sunlight, which we utilize in the open-air treatment. When a horse gets ill, we turn it out into the field. When a patient is run down, we send him away to the country or the seaside; and every sea-wave that splashes in the air, and every breeze that blows over the hill-top, is charged with electricity, and Nature surrounds the patient with all the electric influences, which operate on his constitution and tend to restore him to health. In electric treatment we follow Nature, and in this artificial age we produce electricity artificially, and harness its agencies to our use in our battle with disease and microbes.

There are many ways by which static electric treatment benefits the patient suffering from pulmonary tuberculosis.

1. **Its General Tonic Action.**—When a consumptive comes under the physician's observation the soil is already impoverished, the general health undermined, the appetite impaired, and the nervous system in a low, irritable condition. Here the static treatment acts like a general tonic, bracing up the nervous system, stimulating the functions of the body, promoting general nutrition, and improving the appetite, and in this indirect way helps the patient to regain his health. Nature at the earliest stage of the disease does not require more than temporary help—like a small loan a man requires when he is temporarily embarrassed, and which puts him on his feet again.

2. **It Increases Glandular Activity.**—At a later stage, when tubercle bacilli have invaded the lung tissue and their toxins have permeated the system, and when respiratory and circulatory functions are interfered with, static treatment, besides its tonic and stimulating effect, increases the force of deep respiration, quickens circulation, promotes perspiration and other glandular secretion, and increases the metabolism of the body, so that the excretion of urea is increased, and uric acid in the system lessened. When we

realize that health depends upon the proper elimination of all the excretions and poisons of the body, we can understand that the static treatment, by promoting tissue change, and helping the organism to get rid of the toxins and other deleterious matter, aids the process of repair of the lung.

3. **Hyperæmia.**—Hyperæmia is present in all phenomena of life, in all forms of growth, in all physiological and pathological activities. One of the most important methods by which Nature cures disease and relieves pain is by promoting hyperæmia. A grain of sand falls upon the eye, which becomes red and congested, tears ooze and bathe the eye, and remove the offending element. The temporary congestion of the eye is not a morbid process, but Nature's way of driving out the foreign body.

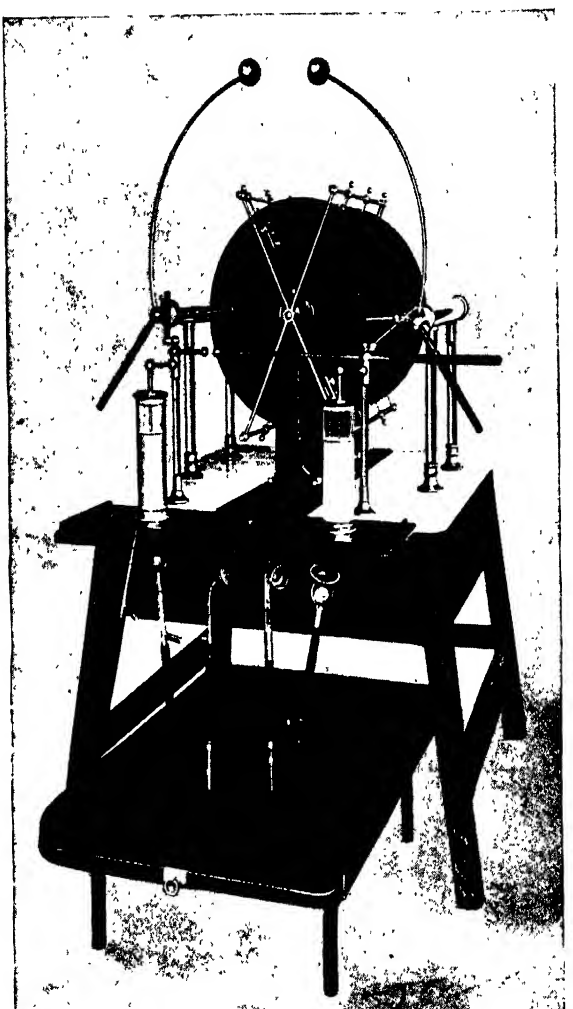
So in pleurisy. All pleuritic affections, as it is coming to be recognized, are of microbic origin—rather, the inflammation of the pleura is the result of the invasion of microbes. When micro-organisms attack the pleura, Nature calls for reinforcement from other parts of the body; the pleural membrane gets congested, leading to the exudation of serum, which attempts to wash away and neutralize the poison, and of leucocytes, which attack the intruder and overcome him.

In pneumonia, which is the result of the invasion of micro-organisms in the lung, the inflammation is not so much a morbid process as Nature's way of meeting the enemy by bringing a larger supply of blood to the seat of the attack.

So when a finger gets poisoned and swells, the redness and swelling are not truly morbid, but Nature's method of bringing help to the affected part to prevent the entrance of pathogenic organisms into the system.

If Nature brings sufficient reinforcement to the battle-field, well and good. The pleurisy gets well, resolution takes place in pneumonia, and the swelling of the finger subsides. It is only when Nature fails to meet the situation that the process, to my mind, becomes morbid. Sometimes, in her zeal, she may bring in too much blood to the part, as in some cases of pneumonia, nephritis, etc., or, in her weakness, the supply may be poor in quantity and quality, as in some chronic

PLATE IX.



THE 'ERGOS,' THE AUTHOR'S STATIC MACHINE FOR X RAYS STATIC PHORESIS.

To face page 160.

ulcers of the leg, etc. Here the physician who watches the operations of Nature, and works with her, comes in with his help; and in one case he draws off the extra blood by counter-irritation, etc., and in the other mechanically regulates the supply, as by Esmarch's bandage, etc.

In pulmonary tuberculosis Nature effects a cure in the same way—viz., by causing a temporary hyperæmia in the lung substance. When tubercle bacilli have pierced through the first lines of defence, and encamped over the upper portion of the lung, an alarm is given, reinforcement is sent to surround the tubercle, and many and many a case of early attack of consumption gets well by this prompt action of Nature long before the patient has any knowledge of the existence of disease in him, or the physician can find out any signs of its presence. At a little later stage, but still very early in the invasion of the lung, how many cases get well which present a history of early hæmoptysis, which is simply an external sign of hyperæmia of the lung at the affected area! At a still later stage, when patients generally come before the notice of the physician, the majority of cases that get well are those which respond to the attack of the enemy by inflammatory reaction—which means that zones of congestion appear and surround every tubercle nodule; a battle royal takes place, when leucocytes, migratory cells, phagocytes, all crowd round the enemy and destroy him in great number, while the blood-serum, bathing the injured lung, and taking up the toxins and neutralizing their deadly action, prevents any further spread of mischief. Remedies that have from time to time been advocated in the cure of pulmonary tuberculosis—such as Koch's tuberculin, Professor Landerer's injection of cinnamic acid, intravenous injection of formalin—all aim at success by creating an inflammatory zone round the affected area.

Professor Bier, of Bonn, first introduced passive hyperæmia for the treatment of tubercular disease. He, with other physicians like Rokitansky, found that the plethoric condition of the lungs accompanying diseases of the heart gave immunity against tuberculosis. The writer, who can confirm

this from his own experience, has found that pulmonary tuberculosis of a congestive type has a better chance of recovery than cases of a chronic anæmic type.

If Nature brings about healing in the lung by producing hyperæmia, we must follow her if we would attain the same object, and help her in those cases where, for some reason or other, she fails to bring about a healthy inflammatory reaction in the lung tissue.

Fresh air, by invigorating and stimulating the functions of the body, and by increasing the power of respiration, tends to bring more blood and nourishment to the diseased lung, and hence the beneficial effect of the open-air treatment in consumption. The principle of Kuhn's suction mask is to bring about the arrest of tuberculosis by producing hyperæmia, and in my experience the static electric treatment does the same.

The relation between electricity and hyperæmia has been recognized by Professor Bier when he says: 'The use of massage and electricity produces strong active hyperæmia. Probably a large proportion of this last efficacious remedy consists in the production of hyperæmia.'[1] The writer quite agrees with Dr. Curtis Webb when he attributes most of the beneficial effects of static treatment to cell vibration and hyperæmia.

The application of the breeze and the brush acts like a counter-irritant, and increases the activity of the sweat glands. The rapidly interrupted charge and discharge of the patient by a current of an enormous voltage, but of infinitesimal ampèrage, sets up cellular vibration or wave-current, which corresponds to what Dr. Curtis Webb aptly terms 'histological massage.' This wave-current is a deeply penetrating one, the cellular vibration taking place in structures far beneath the skin. The treatment by sparks produces effects very similar to those of the wave-current, but the interruptions are more sudden and powerful, and the contractions obtained are less of an oscillatory character. All these modalities, when applied over the chest, produce hyperæmia,

[1] Professor Dr. August Bier, 'Hyperämie als Heilmittel,' p. 16.

increase the flow of blood in the lungs, help the absorption of inflammatory products, and promote the healing of the lung. The clinical effects of the static treatment are especially seen in those chronic cases of tuberculosis which suffer from low vitality and impaired metabolism, in cases associated with pleurisy, with pain (where the treatment acts like a charm, the pain and crepitations disappearing in two or three applications), in laryngeal affections with congestion or catarrh of the vocal cords.

4. **Static Phoresis.**—There is still another way by which high-potential currents can be utilized in the treatment of

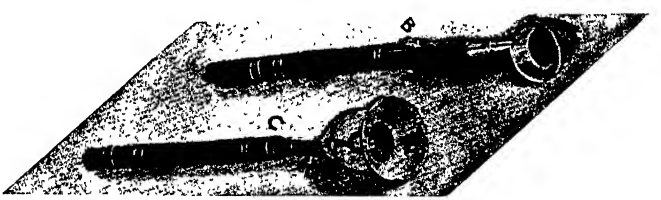


FIG. 6.—B. DR. MORTON'S VACUUM ELECTRODE FOR STATIC PHORESIS. C. AUTHOR'S ELECTRODE FOR THE TRANSFUSION OF FORMIC ALDEHYDE.

pulmonary tuberculosis, though the study of its action is still in its infancy. Dr. William J. Morton, of New York, has demonstrated that drugs can be introduced into the living tissue by means of the electric pressure and directional flow of high-potential currents, and has devised one or two electrodes for the purpose. One of them is a vacuum electrode, made to hold some porous material, such as asbestos, and containing the medicine desired to be introduced through the patient's skin or mucous membrane. It is found that the absorption of many volatile substances is facilitated when subjected to the discharge from the positive pole. The writer has been treating patients by this method, and has designed an electrode for the transfusion of formic aldehyde with substances such as terebene, oil of pine, menthol, etc. If mercurial salts, iodide of potassium, salicylates, antiseptics, etc., have been introduced in this manner in the treatment of lupus, tuberculous glands, etc.,

with success, why not in tuberculosis? The method of phoric introduction of medicines by high-potential currents opens out a wide sphere of usefulness, and promises to have important results in the treatment of consumption and disease in general.

5. **Gamma Rays.**—The use of gamma rays in the treatment of pulmonary tuberculosis is in much favour with Continental specialists.

The gamma rays are obtained from the emission from an excited Crookes tube. The X rays are made to pass through silver and aluminium screens[1] which absorb the alpha and beta rays, but the gamma ones pass on, and electrolize the living tissue through which they pass. These gamma rays do not cause any ill or burning effects or radio-dermatitis, so that sittings extending to thirty to forty minutes are given in safety. Some Continental authorities are very sanguine of the value of this modality in combating tubercular infection.

[1] Guilleminot on 'Radiochroisism.'

PART III

'As health is such a blessing, and the very source of all pleasure, it may be worth the pains to discover the region where it grows, the springs that feed it, the customs and methods by which it is best cultivated and preserved.'—SIR WILLIAM TEMPLE.

CHAPTER I

SOCIAL AND ECONOMIC FACTORS OF TUBERCULOSIS

'Nature softening and concealing,
And busy with a hand of healing.'
WORDSWORTH.

'Verily a place of healing shall the earth become.'—NIETZSCHE.

TUBERCULOSIS is the greatest plague of civilized humanity. It has followed the wake of every civilization. It is both the parent and the child of poverty. Like the angel of death, it is no respecter of persons. It claims its victims from every clime and country. While it kills more poor people, it does not spare the rich. It is rife in towns and cities, in dark and insanitary dwellings, in crowded tenements and sweating dens, where the sunlight scarcely enters, and fresh air is a stranger. It cuts short the breadwinner in the very flower of manhood. It impoverishes the family and the nation, and fills many a home with misery and ruin.[1]

[1] 'Every year the world lost 5,000,000 of people through the scourge of tuberculosis—which means that every year a London perishes from one disease; while Great Britain alone lost 80,000, a number equal to the population of Oxford and Cambridge combined. And, worse still, there were in England and Wales 300,000 sufferers from consumption, a number as great as that of all the people in Wiltshire. London had 9,176 deaths, or more than were caused by wounds in the whole three years and a quarter of the South African War. The death-rate was now reduced from 247 to 115 per 100,000, or 56 per cent. decrease in forty years. Notwithstanding this improvement in this country, tuberculosis was now responsible for 1 death in every 11. Fifty-six per cent. of the

Tuberculosis is a social disease, the outcome of social and economic conditions which gradually evolved out of modern civilization. The awakened energy of England during the last century manifested itself chiefly in two ways, among others: (*a*) In the conquest of world-wide empires, in the opening of foreign markets, in the extension of trade and commerce, and in the accumulation of wealth. (*b*) The industrial and commercial expansion meant the multiplication of machines and mills, of factories and workshops; the overcrowding of towns and manufacturing centres, where economic stress and competition, seasonal trade and casual labour, brought about irregular work and unemployment, which led to poverty and want. So that civilization has tended to create two opposite evils—wealth and poverty. The measure of the wealth of a country is the measure of its poverty. Both conditions have brought about physical and moral inefficiency and disease. But as the consequences of poverty and other social evils attending it are very prevalent and widely felt by society and the nation, it justly claims the serious consideration of all thinking people and well-wishers of their country.

Of all the predisposing causes of consumption, poverty[1] comes first and foremost. This is why tuberculosis is

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total deaths from consumption occurred between the ages of twenty and forty-five years—the prime of life, physiologically and reproductively. One-seventh of the total deaths among members of Friendly Societies was due to this cause—which means wages wasted, contributions dissipated, and homes destroyed. No wonder 40 per cent. of our total pauperism was due to widows and orphans, one widow in every three under sixty-five being either on the Poor Law or some public fund. While the general death-rate from consumption was 132 per 100,000, it was only 78 in happy, prosperous, healthy Hampstead, but 215 in Finsbury, with its one- and two-roomed tenements, its low wages and irregular work. Of every 1,000 German workmen between the ages of twenty-five and forty who were unfit for labour, 548 were sufferers from tuberculosis. Among the invalidity pensioners of Germany, more than half were consumptives.'—*Extract from the speech of* MR. JOHN BURNS, M.P., *at the Tuberculosis Exhibition, London, June,* 1909.

[1] The term 'poverty' is used in its widest interpretation in this chapter.

mainly a disease of the poor. It is reckoned that about 70 per cent. of consumption occurs among the poor. By the poor we do not mean the working classes only; we include all those whose income is not sufficient to provide them and their families with those bare necessaries of life which are essential for the maintenance of physical efficiency and health. This includes many classes and conditions of workers—from the homeless vagrant and the casual labourer to the humble clerk, the impecunious curate, the draper's assistant, and the shop-girl, whose poverty is no less terrible because it is hidden under respectable appearance, and whose margin of subsistence is so narrow that any economic disturbance or ill-health would precipitate them to the verge of distress and destitution. The writer, while professionally working for many years in the north of London, found many opportunities for studying the question of poverty in relation to disease. He found in many instances that poverty was intimately associated with consumption, and that its burden overwhelmed and crushed the honest poor. It creates a vicious atmosphere in which drink and disease, slums and overcrowding, vagrancy and homelessness, crime and insanity, go to form a circle. All the social evils gather round poverty, drink, and overcrowding. There is a difference of opinion as to whether poverty is the outcome of drink, or drink creates conditions of poverty. It is, indeed, very difficult to separate the causes and effects of these two evils, as they act and react upon each other with greater and greater intensity, and from one generation to another. In the writer's experience drink is not the first cause, and is very often the child of poverty and bad housing. True, alcohol is a terrible curse: it curses every nation that touches it, and is a potent cause of disease and degeneration, while it intensifies the evils of poverty. But poverty in many and many instances is the parent of drink by directly provoking it in some instances, and in others by weakening the will so that the victim falls an easy prey to its temptations. When the two evils go together, the physical and moral degeneration become profound. When poverty, overcrowding, and drink

combine their deadly forces, the deterioration becomes complete and continuous, its consequences being handed down from parent to child for more than one generation.

Poverty leads to overcrowding. The man who once with his family occupied three or four rooms is obliged, as the result of unemployment or ill-health, to curtail his accommodation to two rooms; and for the same reason the man who rented two rooms is forced to live in one. In London, according to the last census, there are 304,874 one-roomed tenement dwellers.[1] The writer has seen as many as ten and twelve living in one room—a state of things where decency is not possible, and morality a farce. The migration of the country people into towns creates a greater demand for house accommodation, making the rent go up, and aggravating the evils of overcrowding. Poverty and bad housing lead to drink. The wretched overcrowding in insanitary, ill-ventilated, and evil-smelling dwellings, where men, women, and children live huddled together, is a terrible incentive to drink. The noise and clamour of children, the dirt and squalor of a one- or two-roomed house, hunger and want, drive many a workman to the public-house, where he finds cheer and comfort in the light, warmth, and companionship. The poor crave for a stimulant to drown their misery and sorrow, and add a little brightness and relaxation to their lives; while the rich run after drink to quench the thirst created by high and luxurious living.

Poverty, overcrowding, and drink, act and react—each intensifying the evil effect of the other—lower vitality, sap physical manhood and womanhood, and open the door to tuberculosis and other diseases. Physical inefficiency leads to mental and moral weakness. Poverty starves the brain, dulls the intellect, takes away self-respect and a spirit of

[1] 'That the rate of mortality is influenced by overcrowding is shown by the fact that in Dundee the death-rate from pulmonary tuberculosis in houses of one room was 74·4 per 10,000; in two rooms, 64·1 per 10,000; in three rooms, 55·2 per 10,000; and in four rooms and upwards, 32 per 10,000.'—*Supplement to the Thirty-fifth Annual Report of the Local Government Board*, p. 94.

independence. The brain gives way under the constant dread of hunger and anxiety. The unemployed becomes in time the unemployable, as, when he loses all heart and ambition in life, he loses the interest and the power to work.

It is often contended that the poor are thriftless, and that their poverty and misery are caused by their own wrong-doing, or by their defective moral character. Mr. Rowntree has shown that the average working-class family lives so near the bare margin of subsistence that it cannot possibly save, even on a small scale. In the writer's experience, when one probes the social problems deeply, one finds that the truth often lies the other way—viz., that poverty and a circle of evils associated with it demoralize the poor, goad them to despair and recklessness, and lead to physical and moral inefficiency, so that the depraved and the dissolute, the weak in body and in intellect, the degenerate and the criminal, are the outcome of modern social conditions in which they have been brought up for a generation or more. They are often no more to be blamed than the person who suffers from consumption is to be blamed for catching the infection.

The burden of poverty and destitution fall specially heavy upon the child, the sick, the infirm, and the aged. The unfortunate child that is born of poverty inherits the weakness of its parents, and begins its life very much handicapped. Add to this fact that a large majority of them cannot get the natural food from their mothers, who either have no milk with which to feed them, or their work in mills and factories gives them no opportunity to nurse the little ones. Hence the terrible infantile mortality, which is due either to insufficient feeding or contaminated milk-supply. When the children do survive these bad conditions, their bodies are stunted, their teeth decayed, their digestion weakened, the bones rickety, their whole constitution starved, and they become a prey to scrofula, tuberculosis, etc. No wonder many of the young people bred in poor and ugly surroundings, brought up by wrong feeding, bereft of sound education and moral training, deprived of home life and influence, have not the stamina or the strength to face life's

stern duties and problems, and drift away by strong undercurrents, and sink to a lower and lower abyss, giving birth, in their turn, to children as physically and mentally defective as themselves, to swell the ranks of inebriates and criminals. The want of fresh air and food in the early years of childhood is seen in the decline of vigour and vitality of young men and women. One has but to look at the pale, tired faces, stooped shoulders and flat chests of the mill, factory, and shop-girls in the big manufacturing centres and towns to notice the degenerating effects of the modern industrial conditions of life. During the recruiting in London for the late Boer War about 40 per cent. of the applicants were rejected as unfit. Out of 34,000 men who offered themselves for enlistment into the regular army during the year ending 1907, 16,000, or 46 per cent., were rejected for physical reasons ; the percentage of rejections being higher in the manufacturing centres like Leeds, Newcastle, and Manchester.

In a constitution whose powers of resistance are weakened by poverty and unhealthy environment the germs of tuberculosis find an easy entrance and easy prey, and gather a rich harvest. But poverty, we repeat, is the most important predisposing cause. If the body is well nourished and fortified, it can withstand any amount of microbes and disease. The writer has noticed over and over again that many a workman, in spite of his filthy surroundings, maintains his health as long as he earns good wages and lives well. The reason why the Jews resist consumption or any other infectious disease better than the Gentiles, in spite of dirt and the vitiated air of their overcrowded dwellings, is because the Jewish mothers know better how to feed their children with good and nourishing food, proving that good feeding is more important than sound sanitation and hygiene.

Thus tuberculosis is intimately associated with all the social inequalities and social wrongs. Behind consumption lies poverty and other evil factors, and behind these, again, lie larger issues—the question of unemployment, the

distribution of wealth, fair wages, the regulation of hours of labour, the land question, housing, etc. If we consider a moment, we shall find that almost all the social problems of the present day have been the outcome of trying to enjoy the sweets of civilization without attempting to take up the obligations and responsibilities which civilization brought with it. In our hurry to get rich at all costs, and to dig out wealth from the bowels of the earth, we have forgotten we have left on the surface heaps of rubbish piled up on all sides—the pauper and the drunkard, the degenerate and the unfit, the feeble-minded and the insane—who are the scourge and source of weakness to every society and nation. It is one of the terrible ironies of the present day that, while England is constantly extending her conquests in circumference, in the very centre of the Empire her own sons and daughters find no room to live, and go about the streets in want of the barest sustenance that is not denied to the savage and the Hottentot; that while she is spending her energy in conquering and killing her foes hundreds of miles away, she has allowed the enemy at her very door to destroy thousands of her children in the prime of their lives. Mr. Rowntree, in his book, declared that there were no less than 13,000,000 of the inhabitants of the United Kingdom on the 'hunger line.' Sir James Crichton Browne said that there was reason to believe that 30 per cent. of the population were still living in poverty, ill-clothed and underfed, and in insanitary conditions conducive to mental deterioration. England's real foes are not outside, but are within her own borders—foes that are sapping the life-blood, and causing the physical and moral wreck of her citizens.

But the greatest of all evils brought about by the social and industrial revolution of the present day is the disintegration of home. The factory and the Poor Law system among the poor, the employment of women as clerks, teachers, shop-assistants, and in various other capacities among the middle classes, the growing life in flats and furnished houses and hotels among the upper classes—all have a tendency to break up the family life. **The decay of home life seems to**

be the greatest menace this country has to fear. For no race or nation can be reared without a home and all the sweet and sacred influences which go to build up a healthy manhood and womanhood. As Lord Rosebery once said, 'In rookeries and slums an imperial race cannot be raised.' Homelessness is the result of the conditions of poverty on the one hand, the love of luxury and impatience of restraint and responsibility on the other. The growth of female labour in factories and mills has unfitted the women to do the duties of good wives and good mothers. It has robbed the children of a mother's love and sympathy and care, which are their birthright. It has been shown that the greater the employment of married women in a district, the greater the rate of infantile mortality.[1] Also, the employment of women has, to a great extent, caused the neglect of home duties and interests, and has driven many a husband to the public-house. It has loosened the tender ties and associations which bind the various members of the family together, and which make home the centre of influence and attraction. Around the family life gathers that moral and religious life which in the young lays a foundation for right ideals and character, and which gives stability and strength to the youth and the maiden in the long strenuous years of their after-lives. When the family and religious life decays, the race indeed degenerates. The real degeneration of a people is not brought about by their inherited or acquired physical and mental weakness, the outcome of vicious social surroundings, which can be more or less overcome by good and healthy environment either in one generation or more. But the decay of morals and character set in a nation is indeed more permanent and lasting.

Thus the social and economic wrongs caused by the modern conditions of industrial life have created social evils and disease; and tuberculosis, which is largely associated with poverty and drink, overwork and under-

[1] In the cotton cities of Lancashire, where 28½ per cent. of the women employed over eighteen years are married, the infantile death-rate is as high as 200 per 1,000.

feeding, long hours and low wages, bad housing and no housing, has a far-reaching significance, and should be considered in all its bearings and effects. The purpose of evolution is to lead man from a primitive life to gradual stages of progress and civilization. Progress involves struggle, and struggle means conflict and distress. But life is so ordained that opposition and conflict exercise and strengthen the powers of the organism. The salvation of an individual as well as a nation lies in that way—the way of struggle, suffering, and sacrifice. While we deplore the effects of poverty, destitution, and disease, we must not forget that the seed must die before it can live, and that the failures and mistakes of a nation should be made the stepping-stones for the realization of larger sympathy and service, and for an endeavour to secure a larger life and health to fallen humanity—humanity that is crushed by the grievous burdens which society and social inequality have imposed upon it.

CHAPTER II

REMEDIAL AND PREVENTIVE MEASURES

'On the cool flowery lap of earth
Smiles broke from us and we had ease;
The hills were round us and the breeze
Went o'er the sunlit fields again;
Our foreheads felt the wind and rain,
Our youth returned.'

MATTHEW ARNOLD.

'Over these fields of ours the winds of heaven shall be pure, and upon them the work of men shall be done in honour and truth.'—RUSKIN.

WE have seen that the problems of tuberculosis and poverty are closely associated with each other, and with other evil factors which are the outcome of vicious conditions of modern life. No treatment, therefore, of tuberculosis or poverty can be considered permanent or satisfactory which does not go to the root of the matter, and aim at removing the causes which are responsible for those evil conditions. Both tuberculosis and poverty are only symptoms of social disease which is festering, corrupting, demoralizing the people—a running sore, spreading its infection to all classes, and becoming a peril to the whole community. Having taken an interest in the study of social questions for many years, both in a professional capacity and as a private citizen, and belonging to no party or politics, the writer is in a position to speak freely on the subject.

England has not hitherto seriously taken to heart the appalling social and economic evils which are year by year growing more and more complicated and more and more

difficult to solve—evils that are undermining the physical and moral health of the people, and are becoming the despair of the reformer and the politician. Having realized the greatness of the task, she must set to work with courage and determination to solve those problems, and bring about a social regeneration before it may be too late.

To clear the ground, we will state below some of the fundamental principles on which social reform should be based.

1. **The Nation must go to the Root of the Matter.**—Hitherto the nation has only been tinkering at the subject, and adopting only palliative measures. Merely giving relief to the people after they have become paupers is like sprinkling some carbolic powder over a broken sewage-pipe. The disinfectant only disguises the real danger of infection and disease. The Poor Law system is based on the principle that no man shall receive help till he has become destitute—which is similar to letting a consumptive reach the last stage and then building a sanatorium for him to die in. The workhouse system is both demoralizing and inhuman. It tends to intensify the misery of the people, multiply pauperism instead of diminishing it, while the results produced are not commensurate with the money that is spent upon it. It should therefore be abolished. So also private doles and charities aggravate the very evils they intend to relieve, and should be discouraged, if not put an end to.

2. **The Nation alone can do it.**—Both because the social problems are the most vital questions of the day—as they concern the very existence of the people as a nation—and are too gigantic to be grappled with by private reformers and philanthropists, it should be the duty of the Government to undertake a constructive reform that shall aim at removing the evils which are responsible for poverty, overcrowding, unemployment, etc.

3. **The Nation should undertake the Treatment Early.**—The open-air movement has taught this most precious lesson: that when consumption is taken in hand in its early stage, more than 90 per cent. of the sufferers can be restored to

health. So with poverty and other social questions—if steps could be taken to deal with them in their incipient stage, a great amount of economic drain, as well as pauperism, misery, and suffering, could be saved.

4. **The Nation should legislate for Clean Conditions of Life.**—As the efficiency of a race depends upon the health of its people, the nation must see that its citizens have opportunities to obtain clean air, clean food, and clean homes. For this purpose, existing laws relating to public health should be enforced, and, in addition, fresh legislation made to obtain healthy conditions of living.

5. **Physical Efficiency should be supplemented by Moral Efficiency.**—Physical efficiency alone will not entirely save a nation from degeneracy. Reform must not only come from without by laws and legislation, but from within by the cultivation of high ideals. Hence the importance of efficient education, the building up of family life, and all other means to elevate morals and character.

6. **Not only Measures, but Men, are Needed.**—Laws and legislation will not avail much if there be no intelligence and sympathy with which to enforce them. You may fill the statute-book with laws to meet every social need; if there be no co-operation of men and women imbued with a spirit of justice, of kindly feeling, and of disinterested service, to help the State to carry out its proposals, both laws and reforms will remain a dead-letter.

How are these principles of social reform to be carried out in practice? The writer will now describe the main points of a scheme which the reader will see is not entirely novel, but has much in common with the measures already in force or with those proposed by various authorities.

1. Dividing the scheme into two parts, remedial and preventive (see chart of scheme, p. 185), all remedial measures would be systematically and scientifically dealt with in depots or institutions opened all over the country for the purpose.

2. Every institution or depot would be divided into various departments, each of which would be under the control of

the respective committees of the County or the County Borough Councils.

3. The work of the Councils, so far as public assistance is given, would be under the supervision of the national Government through a Cabinet Minister.

4. The Cabinet Minister for social service, while presiding over the remedial measures, would find his main work in dealing with preventive measures, whose object would be to build up the physical and moral vigour of the people.

5. With this intent he would take steps to enforce the laws already existing in regard to public health service, and would bring in from time to time others to maintain the efficiency of the workers employed in various industries and occupations.

6. Above all, he would concentrate his efforts upon legislative measures and other ways, to save the country from being depopulated, by making it attractive, and by giving the people a direct interest in the land.

1. To take these points in the scheme one by one. All social evils should be regarded as disease, and treated summarily and scientifically, as a surgeon deals with patients that come before him in a general hospital. How do big hospitals deal with sick humanity? The patients that enter a hospital with all kinds of ailments are seen by an officer, whose first duty is to sort them out according to the kind of illness they suffer from; and then he sends surgical cases to the surgeon, the medical cases to the physician, the ear cases to the aural department, the eye patients to the ophthalmic department, and so on. Cases of emergency are taken in hand by the resident medical officer, who sends any serious cases to the in-patient wards of the hospital. Thus every patient is dealt with promptly and according to his need. So, in place of the Poor Law, the State should establish in every district depots or industrial centres, where the socially sick seeking assistance would be admitted, and find all the information and help they need ready at their service. The mixed workhouse, where the poor of all ages, sexes, and conditions are herded together, has been denounced by more than

one Poor Law Commission. The Poor Law system, as it exists to-day, has not the means, the material, or the men to cope with the ever-increasing problem of destitution, to discriminate cases, or to give relief in the earliest instance, so as to prevent any of the social evils from doing further mischief. Its help is like that of a man who lets a fire take hold of a house, and then tries to extinguish it with a few buckets of water. Or, to use another figure, its principle of relief is like waiting for a ship that has sprung a leak to sink, and then trying to bale out the water. No wonder that, in spite of millions of money spent on relief, the number of submerged humanity is increasing. What England wants is not relieving-houses, but preventive establishments, where poverty and other evils would be dealt with in the earliest possible stage. Hence, in place of workhouses, there should be established all over England depots in charge of a principal officer, who would sort out all cases that seek assistance, and send them to different departments, which would be managed by officials under him.

2. Each depot would be divided into departments dealing with the children, the sick and the aged, the feeble-minded and the insane, and the unemployed. The case of the children would be dealt with by the Education Committee, the sick and the aged by the Public Health Committee, the feeble-minded and the insane by the Asylums Committee, and the unemployed by the Labour Committee of the County or Borough Council, or whatever is the recognized elected authority of the district. Each department would bring its expert knowledge in handling its cases thoroughly and efficiently, and, all the departments being controlled by one body, there would be no overlapping either in the work or in the giving of assistance. Thus the Children's Department, working in connection with the Education Committee, would take entire charge of all questions concerning children, such as education, medical inspection, the feeding of hungry children, open-air schools, children's sanatoria, etc. To the Health Department there would be appointed a medical officer, who would devote his time in attending to the sick

and the infirm, and sending serious cases to be treated in the infirmary which would be in connection with each depot or a group of depots. The present infirmaries could be utilized for the purpose. The Health Committee would also take in hand the following measures to combat tuberculosis: (*a*) In connection with each depot, or a group of depots, there would be a dispensary, which would perform the fourfold duty of disseminating literature and information to consumptive patients and their friends concerning tuberculosis and the means of checking its spread; of dispensing, if necessary, medicines, sputum-flasks, milk, and other articles of food; of arranging visits of physicians and nurses to bed patients, and of selecting suitable cases for sanatorium treatment. (*b*) The provision of national sanatoria could be undertaken by the Government, with or without the aid of local Councils. It has already been pointed out that the most efficient and economical sanatorium is that which is built on the châlet system. The cost of building a châlet, as described on p. 132, with a veranda in front and a corridor at the back, would not be more than £30 to £35 pounds.[1] (*c*) If a new sanatorium is not available or forthcoming, as a temporary provision, a few beds could be subsidized in the already existing sanatoria. (*d*) Homes would be found necessary for advanced cases, or for those who have no friends or relatives to look after them.

With the Unemployed Department there would be a Labour Exchange, which would be in communication with other depots, and thus all information regarding where labour could be found would be posted up in every depot, enabling workmen to find work without delay. Relief works for the unemployed to relieve seasonal distress are no real remedies, but do more harm than good. There is no use of putting the London unemployed to work on the land, or on afforestation or reclamation, unless he is previously trained. The chief aim of the Labour Exchange would be to regulate labour, if possible with the help of the State, to warn workmen of the

[1] The cost of a châlet, with plain furniture, as described on p. 133, exclusive of heating and lighting, would not be more than £40 to £45.

times of trade depression, and help them to find work immediately by making the Exchange the best medium for obtaining labour, so that their families might not be broken up. The Labour Bureau would arrange to give temporary help to workmen, either to meet their travelling expenses, or for board and lodging while in search of work; and all assistance given in every department—whether for feeding a hungry child, or for the support of the feeble-minded or the insane, or for the sick and the unemployed—would be communicated to the principal officer, who, with the help of qualified assistants, would levy charges, and recover from those able to pay. The Labour Committee, besides dealing with the unemployed, would take in hand the unemployable —the honest and the work-shy. It would place the former class in training institutions or farm colonies to fit them for some trade in the town or country, to enable them to earn their own living. The work-shy would be put in detention colonies, not so much as a punishment as to reform their character, and give them opportunities to find their salvation in work. Crime and vagrancy would also be taken in hand by this committee, and be treated as disease; and the physically and mentally unfit would also be trained, to see if better environment would restore their strength and vitality, so that they might once more take their place as members of society.

3. The work done by the various committees of the Councils would be recognized by the national Government, who, through the Cabinet Minister for Social Service, would keep control and supervision over all the industrial centres, and thus insure in them a unity of purpose and efficiency of action. The funds necessary for the various remedial measures would be defrayed from local taxation, and any contribution to meet the local deficiency would be arranged by the Government.

4. While the Minister for Social Service, on the one hand, controls the remedial measures, on the other he would be wholly engaged in looking after the preventive measures. This would include all kinds of legislative proposals that

PLATE X.

A PINE AVENUE.

To face page 182.

would be brought from time to time to maintain the health and the efficiency of the workers and their families. Of course, both kinds of measures would be worked in such a way that one would supplement the deficiency of the other; and the more thoroughly the right-hand measures of prevention were carried out, the more surely the number of the unemployed and those seeking relief on the left hand would be diminished.

5. The legislation through Labour Exchanges and otherwise would be so directed as to render opportunities for the workers to find employment at a rate of wages sufficient to maintain themselves and their families, so that homes might be kept intact, the children cared for, and the mothers find congenial work in looking after their family duties.

For men—

(*a*) **Labour Exchanges.**—See remedial measures.

(*b*) **Inspection of Mines and Factories.**—More inspection of mines and factories, and a better service of inspectors to insure ventilation, plenty of air-space and light, and other sanitary precautions necessary for the health and safety of the workers.

(*c*) **Reduction of Hours of Labour.**—Prolonged adult labour is one of the most important causes of physical deterioration. No person should work in a shop or factory for more than nine hours a day or fifty-four hours a week. Mr. Revière, in his report to the International Congress for the protection of workers in Paris, has shown that the production of work per hour was exactly the same up to nine hours, and that if the length of the working day was increased beyond that, the output of work was diminished per hour. Eight till six, with an hour for the midday meal, would at present be an ideal day's work, in which both the employer and the employed would share the benefit. Or eight till seven for five days, and eight till one on the sixth day, would perhaps better meet the wishes of the National Amalgamated Union of Shop Assistants. Even these hours are somewhat too long for strenuous workers.

(*d*) **Wages Boards.**—To fix the minimum rate of wages

which would enable the worker to obtain the necessaries of life, so that he may keep himself and his family in a state of physical efficiency. Also legislation to abolish sweating and dishonest competition of the sweater.[1]

(*e*) **State Insurance for Sickness, Invalidity, Old Age, and Unemployment.**—The best workable scheme of insurance, to my mind, is a joint insurance in which the State, the employer, and the employed join in contributing a fixed scale, as is done in Germany—a system working in co-operation with Trade Unions and Friendly Societies. Some recognized State-aided insurance is an imperative necessity in this commercial and industrial age. It would exert a powerful influence in promoting the health and well-being of the working classes and their families by its provision for relief from want, care, and anxiety, and its prevention of disease, like tuberculosis, by early treatment.

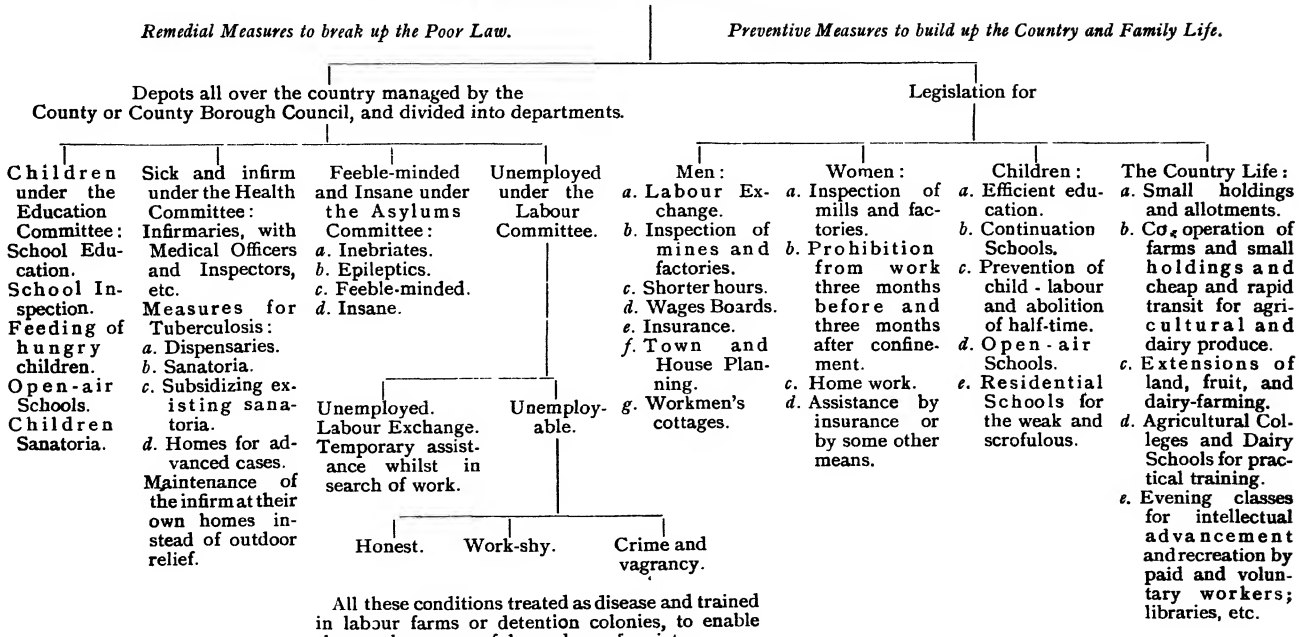
(*f*) **Planning of Towns, Suburbs and Villages, Factories, Houses and Cottages**—on the lines of the Housing and Town Planning Bill—to insure beauty, health, and efficiency.

[1] After carefully going into the question of a minimum wage, I find that it would not be possible for a workman, his wife and four children, to live in a bare state of efficiency on less than 36s. a week in the town, and 31s. in the country. This wage is made up of the following weekly items:

	s.	d.
Food at 8½d. per head (two children count as one head)—*i.e.*, 2s. 10d. a day, or a week	19	10
Rent	6	0
Coal and lights	2	6
Travelling by trams, etc.	2	0
Sick benefit, insurance, etc.	1	0
Tobacco and daily paper	0	6
Children	0	2
Boots, clothing for the family	4	0
	36	0

This does not allow any margin for beer, repair of tools, wear and tear of bedding, furniture, for holiday, or any small luxuries. In London, the allowance of 6s. a week for rent would only obtain two rooms, and if another room were required, it would cost another 1s. 6d., leaving only 2s. 6d. a week for the clothing of the family, which is not sufficient.

A SCHEME OF REFORM TO COMBAT TUBERCULOSIS, POVERTY, AND OTHER SOCIAL EVILS.



It has been shown by the open-air, the garden city, and other movements, that fresh air and sunlight, beautiful and healthy surroundings, are essential for the sound development of body and mind, and for the growth of child-life.[1] The housing condition of industrial towns and mining centres is truly deplorable. The existence of insanitary slums and one-roomed houses in towns like London, Manchester, and Glasgow, is a disgrace to any country. The famous American preacher, Mr. D. L. Moody, once said: 'You in Britain stand more in need of homes than of churches.' The building of work-people's cottages is an imperial necessity. Why should fair England be made hideous with rows of monotonous and mean streets, jerry-built houses, and ugly factories? Why should not our dwellings and our places of business be surrounded with ample open-air space and gardens, with free admission of fresh air and sunlight? Why should not even the humblest cottage be built with taste and comfort? Why should not our suburbs and streets be planned artistically, with a view to colour and warmth, beauty and delight, so that the whole perspective of a city or a village be in harmony with Nature, and give a pleasing appearance, and an air of repose and peacefulness? If men and women are to grow physically and morally strong, and derive pleasure and inspiration from their environment, they must have healthy homes and æsthetic surroundings.[2]

[1] That the growth and nutrition of children are affected by the size of their homes was investigated by the School Board for Glasgow during 1905-1906, who report that: "The one-roomed child, whether boy or girl, is always, on the average, distinctly smaller and lighter than the two-roomed; and the two-roomed than the three-roomed; and the three-roomed than the four-roomed. . . . If we take all the children of ages from five to eighteen, we find that the average weight of the one-roomed boy is 52·6 pounds; of the two-roomed, 56·1 pounds; of the three-roomed, 60·6 pounds; of the four-roomed and over, 64·3 pounds. The respective heights are 46·6 inches, 48·1 inches, 50·0 inches, and 51·3 inches. For girls the corresponding figures are: weight, 51·5 pounds, 54·8 pounds, 59·4 pounds, 65·5 pounds. The heights are: 46·3 inches, 47·8 inches, 49·6 inches, 51·6 inches."

[2] That the general health and physique of the people, especially that of the children, are affected by improved housing conditions, with pro-

For women: Preventive measures should indirectly aim at keeping the mothers at home, so that the children may be brought up in home surroundings, and the family life kept intact as far as possible.

(*a*) **More strict supervision of factories and mills,** to better the condition of women workers.

(*b*) **Wives should be prohibited from work three months before and three months after their confinement,** and help given, if necessary, during that time, by insurance or by some other means.

(*c*) If women must work to increase the family wage, **home-work should be encouraged,** and sanitary and factory inspection extended to workrooms where home-work is done.

(*d*) **In case of sickness of the breadwinner, provision should be made for giving assistance,** which may be covered by insurance or by some other ways.

(*e*) If the condition of wages of men workers is improved by legislation, and wives and mothers need not work to increase the family earnings, married women would be able to look after their homes, and nurse their children in quiet and peace. It is beyond doubt that the breast-fed infants are more free from disease and have a lower death-rate than those who are brought up by artificial food.[1]

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vision for fresh air, sunlight, and open space, is seen by the following figures:

Town or District.	Death-rate.	Infantile Mortality-rate per 1,000 Births.
Letchworth (Garden City)...	4·8	38·4
Bournville (Cadbury's)	7·5	80·2
Port Sunlight (Lever's)	8·0	65·4
Bethnal Green	19·1	155·0
Shoreditch	20·6	163·0
Wolverhampton	14·8	140·0
Middlesbrough	20·3	169·0
Average for twenty-six large towns ...	15·9	145·0

The comparative statistics as to chest-measurement, height, and weight of children in Garden City, etc., and in ordinary communities are even more striking.

[1] While in Norway, where every mother, more or less, suckles her child, the infantile death-rate is 9 per cent., in England it is 16 per cent.,

For children: As regards children, legislative reforms should be directed to develop them physically, mentally, and morally. As the children of to-day will be citizens to-morrow, and carry on the traditions of Empire to another generation, it behoves the State to see that they are equipped for the great task they will be called upon to discharge. Hence time and money spent upon them would be reaped a hundredfold in years to come.

(*a*) **Efficient Education from Six to Fourteen.**—The children's education should aim at fitting them for the life they will be called upon to fill—the town lad trained to some trade, the country youth to agriculture, farming, etc. As it is, torn by rival political factions and religious sects, education in this country is not very satisfactory. Besides efficient teaching, education should include ethical instruction, systematic medical inspection, carefully arranged physical exercises, and, if necessary, feeding of hungry children.

(*b*) **Continuation Classes from Fourteen to Seventeen.**—As the years of adolescence are the most critical time of youth, both because of its choice of some career and its formation of character, moral training should form a part of school curriculum with intellectual training, and the teaching of the three R's supplemented by the three moralities—the social, industrial, and political moralities. Is it too dogmatic to say that all ethical ideals should be based on reverence and faith—reverence for self and others, and faith in the unseen? Continuation classes should be made compulsory; and there should be training colleges and technical instruction to fit the young people for some definite career.

(*c*) **Prevention of Child Labour and Abolition of Half-time below the Age of Thirteen.**—The Inter-Departmental Committee on Partial Exemption from School Attendance lately reported that the division of the children's attention between

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France 17 per cent., Germany 21 per cent., Austria 24 per cent., Russia 28 per cent.

manual work and the school seriously interfered with efficient school-teaching, and helped to weaken discipline and lead to bad habits. Therefore they have rightly condemned the half-time system.

(*d*) **Encouragement of Open-air Schools.**—The children should be brought up to love the open air. One of the most efficient ways of combating tuberculosis is to take the town children in hand, and treat them with the idea that every one of them is potentially tuberculous, and so teach them in open-air schools as much as possible. The school inspection would reveal all weakly and scrofulous children, who should be drafted to residential schools in the country, where life in the fresh air, wholesome feeding, careful exercise, and rest, would increase their resisting power, and enable them to withstand the ravages of tuberculosis. In fact, open-air residential schools would take the place of preventive sanatoria, with school-teaching added.

6. Of all the preventive measures that would bring salvation and health to this country, the most important, the most permanent and satisfactory, and the most pressing, are those which would keep the people in the country, and give them a direct interest in the land. It is reckoned that about 70 per cent. of the population of England have migrated into towns. The steady decline of the rural population is a growing menace which this country must take serious steps to put right. The depopulation of the country is chiefly owing to lack of housing accommodation, lack of getting land, lack of scope for the energies of country youths, and lack of educational advantages. The open-air treatment has taught this important lesson: that, while conditions of town life are enervating and demoralizing, the country life tends to make for health and to ward off disease. Here lies the secret of national efficiency, the solution, to a great extent, of the social problems of poverty, overcrowding, and unemployment. It is not by building more *Dreadnoughts*, but by building more the vigour of manhood and womanhood, that England would meet the increasing demands made upon her by industrial stress and international competi-

tion. Hence she must take all possible steps to stem the tide and divert the flow from town to country.

(*a*) **Small Holdings and Allotments.**—The provision of the Small Holdings Act should be simplified and extended to every village by new powers given to Parish Councils to ascertain the demand for small holdings, and to purchase land for holdings as well as for allotments. If necessary, the County Councils should be made to exercise their powers of compulsion.

(*b*) **Facilities for the co-operation of farmers, small and allotment holders,** and for cheap and rapid transit of agricultural and dairy produce.

(*c*) **Encouragement for more extended cultivation of fruit and vegetables, of dairy farming,** of rearing poultry, etc.

(*d*) **Agricultural Colleges and Dairy Schools.** — With practical training in the cultivation of farms, of orchards, of rearing poultry, making butter; practical instruction in milking and general management of stock; keeping bees—all under expert guidance by men specially qualified for the work.

(*e*) **Continuation Classes.**—Evening classes for promoting intellectual advancement, recreation, etc., for country children, by paid and voluntary workers, and by means of libraries.

Emigration is draining England of some of her best sons. It is absurd to send away strong men and women to other countries to find work when there are here millions of acres of land lying idle and waiting for cultivation. According to Mr. Rider Haggard, 'two-thirds of the productiveness of the soil is run to waste; the desertion of the country is destroying the last remnant of our old village life, and is increasing by a sort of compound interest the monotony and loneliness of a country existence.' Mere agricultural or technical training will not avail unless it is undertaken with a definite object of settling the people in small holdings, with a fixity of tenure, or in some other way giving them a permanent interest in the land. In 1907 this country imported apples, potatoes, poultry and game, eggs, butter, and cheese, to the

value of forty-two millions. At least part of this profit would have remained in the hands of English people by more extensive cultivation and by the revival of dairy, fruit, and other agricultural industries. England has plenty of land and plenty of markets for her goods. Her home market alone is large enough to take in all her produce. But the land question seems to be supreme and most vital of all social questions, and unless it is satisfactorily settled in the interests of the people, the town population will swallow up the country, and the disappearance of the peasantry will be followed by degeneration of the race.

The scope of this volume will not permit us to go more minutely into the subject; the reader must fill in many of the details in the scheme. It is only by attacking the whole cycle of social evils in some such collective programme as indicated here that we shall be able to solve the problems of tuberculosis. We may not be able to eradicate tuberculosis altogether in this generation or the next, but we shall at least lay a sound foundation for the well-being of the people by a combined social reform, so that the disease may be driven back to the farthest limit. Besides, it was leprosy and typhus yesterday, tuberculosis to-day, and probably cancer and insanity to-morrow—all have been provoked by unhealthy conditions of modern civilized life. By going to the root of reform, we shall not only successfully deal with the disease that is most prevalent in the generation, but we shall be prepared to meet any contingency, and make it easier for the next generation to grapple with the problems that may then arise. It must not be forgotten that there has been an awakening of public conscience in regard to social duties. Some legislative reforms have already been attempted, and some happy results have been achieved by the united efforts of the community and by public health and other measures.[1] Above all, the improvement in the

[1] Among the legislative measures already in force or before Parliament are: Small Holdings and Allotments Act, Medical Inspection of Schools, Trade Boards Bill, Labour Exchange Bill, Housing and Town Planning Bill, the Milk Bill, Shop Hours Bill.

health-rate and the death-rate and the decline of tuberculosis have been due, not so much to sanitation or notification, as to the increased standard of comfort obtained by the cheapening of the necessaries of life. Sir Douglas Powell truly said: 'The prevention of consumption involves a much wider issue than the circumvention of the bacillus. The abolition of corn duties and other Free Trade legislation, and improved rate of wages, have done more to diminish the death-rate from consumption than any notification law against the disease would have been likely to have effected.'

Still, we have a long way to go yet; a great deal more is to be done in the way of reform. The Poor Law Commission has lately brought to light the existence of grave social evils, which it says are a discredit and a peril to the whole community, and has made a number of excellent practical suggestions to cope with them. Especially the Minority Report has gone deeply into the question of reform, and we quite agree with its suggestion that the Poor Law system should be abolished, and its duties taken over by the various respective committees of the local Councils.[1] As early as 1905 the writer, in a paper read before the Annual Meeting of the British Medical Association, showed the anomalies of the general mixed workhouse, and advocated its abolition. Whatever may be the principles on which social reform would be based in the future, they should include two things: The break up of the Poor Law and the building up of the country and family life by the provision of freer access to the land by the people. How would this benefit the country? What would the unlocking of the land mean? It would mean more employment in the country, more honourable work done under health-giving conditions. It would mean slums and overcrowding, disease and degeneration, more or less conquered and put an end to. It would mean pure and wholesome occupation to thousands of citizens, living in the open air and pleasant sunshine, and engaged in the congenial task of tilling the fields and gathering in the harvest. It

[1] This is embodied in my scheme.

would mean that the deserted hills and valleys would once more blossom as the rose and ring with the merry voices of happy children. It would mean more peace and prosperity, more contentment and joy of living, over the length and breadth of the land. It would mean that in many a cottage home the family altar would be set up, and 'a race of pure heart, iron sinew, splendid frame, and constant faith,' would keep alive the bygone traditions of its yeoman fathers.

Will these things ever come to pass? Is this only a far-off vision, or will it be brought to a happy reality in the near future? Will the State rise above the clamour of interests and the clash of parties, and combine wise statesmanship with strong sympathy, and find strength and energy to undertake some such constructive reform as here proposed? The State can only rise to the level of the enthusiasm of its individual members. Whatever may be the temper of mind of the individual—be it Conservative, Liberal, or Socialistic—the motives of action to help the toiler, the hard-pressed, and the diseased, must spring from a deeper source than mere compassion or sympathy with the miserable condition of the working or the middle classes. They must arise from motives of high ideals, founded on abiding faith in the unerring goodness and love of the great Ruler of the Universe, whose will and desire is that men should help and serve each other as members of one common family, according to their talents and opportunities. Only a community inspired by such an ideal of faith and service will work in patience to obtain a larger equality of social justice, and will lead in triumph suffering humanity to the golden days that are yet to come.

CHAPTER III

MARRIAGE

THE question of marriage of tuberculous persons is one of great social interest, as it concerns the well-being of the race in the future as well as at present. Fortunately, the question is not difficult to decide, for the influence of hereditary predisposition is not so severely felt in tuberculosis as in diseases like syphilis, insanity, etc. Man can control environment, and can neutralize almost any tendency inherited from the parents. This is especially so in regard to consumption, whose hereditary tendency, when there is any, is produced by evil environment, and is therefore remediable even in the same generation. In fact, if man would help Nature by living in healthy surroundings, she would once more build the broken edifice, and even make the children of consumptive parents stronger than those who were not so tainted. Patients who have been treated in a sanatorium, and who have learnt the secret of right living, can give Nature this help; and if they continue to live a hygienic life, they need not fear that their children will be predisposed to tuberculosis. Young people should wait at least for two years after the disease has been arrested before they contract marriage—providing, of course, that their general health has been satisfactory during the interval. No person should think of marriage as long as there are signs and symptoms of active mischief in one or both lungs. The power of love is stronger than that of microbes, and the patient can call in its assistance in fighting against the disease. For love gives determination, and determination

strength to regain resisting power and to conquer the disease. As in the matter of kissing, so in prohibiting marriage altogether, some authors have taken an extreme view. While deprecating promiscuous kissing whenever two people meet, the writer does not share the opinion of those who discern danger in every kiss. The writer found no tubercle bacilli in the saliva of patients. The whole tenor of this book is to show the importance of subordinating their evil effects to the controlling influence of man, who, through his vital resistance, is the chief factor in the causation of disease. In not placing a formidable barrier against marriage, I am helped by my clinical experience of those who, after leaving the sanatorium with a good record, got married, and had no cause to regret the course they had taken. To give one or two instances:

Mr. P. was a patient ten years ago, with mischief in the left lung. Left the sanatorium after eight months. Married after three years; has three children, all healthy and living.

Miss C. was in the sanatorium seven years ago. Got quite well, and married a medical man; has one child, strong and healthy.

Miss V., in the sanatorium six years ago. Made a good recovery. Has two children, both strong and well.

So I could add more cases. In fact, the prospect of a patient who gets married after making a good recovery is very bright, as marriage is, and ought to be, an incentive to him to lead a regular life, and to keep up his physical efficiency both for his own sake and for those loved ones who are dependent on him.

Married Patients.—As the duties of married life and child-bearing demand a greater tax on the resources of a woman, women patients should take greater care to see that the disease is quite arrested before they enter the married state. In consumptive married women, conception should not be encouraged until they have kept well for two years after the disease has been in abeyance; and even then the future mother should take every precaution to maintain her health and strength by leading the open-air life, taking

regular exercise, avoiding late hours, etc. For childbirth lights up any lingering disease in the lung, the mischief often taking an acute course after the infant is born. If the patient loses weight during the puerperium, and otherwise shows signs of active pulmonary disease, it becomes a question whether it would not be wise to save the mother's life at the expense of the child. I would therefore repeat my advice to young people: that if they would save themselves any future trouble and complication, they should wait at least two years after all symptoms of active disease in the lungs have ceased before they contemplate marriage.

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